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Infrastructure Finance

Volume 1:

Financing Urban Infrastructure in Less Developed Countries

March 1991

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Infrastructure Finance: Financing Urban Infrastructure in Less Developed Countries

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Prepared by:

George E. Peterson
The Urban Institute

for the:

Office of Housing and Urban Programs
U.S. Agency for International Development
Washington, D.C. 20523

The Urban Institute ■ 2100 M Street, N.W. ■ Washington, D.C. 20037
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USAID Development Information Services Clearinghouse
AID/DISC
1500 Wilson Blvd., Suite 1010
Arlington, VA 22209-2404

Phone: (703) 351-4006

ABSTRACT

This three-volume report on Infrastructure Finance is a comprehensive look at issues surrounding the financing of urban infrastructure in less developed countries.

"Volume I: Financing Urban Infrastructure in Less Developed Countries," discusses the public roles in infrastructure finance and examines the gap between funds available for financing infrastructure and the level required to adequately serve urban needs. Currently-utilized options for financing infrastructure are outlined, including self-financing through user charges, capping land values, and borrowing and financing through local government. The special issues of private sector financing of infrastructure and protecting the poor are also explored.

"Volume II: Institutional and Macroeconomic Issues," explores the macroeconomic issues associated with infrastructure finance. This volume also identifies some of the critical issues surrounding capital investment planning and budgeting, and defines a range of possible cost reduction strategies while examining the impacts of each. The final chapter of this volume addresses the use of private capital to finance infrastructure.

The third volume of this report, "Roundtable on Urban Infrastructure Financing," summarizes the presentations and discussion of the roundtable held in Washington, D.C. March 20, 1991. The eleven participants' comments on the topics of mobilizing and allocating capital for urban infrastructure, and cost recovery strategies and applications are highlighted in this 15-page report.

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I. INTRODUCTION

The term "infrastructure" has proved difficult to define, especially when one wants a practical, working definition that will justify including certain kinds of capital facilities for study while excluding others. Sewer, water, and road systems always are counted as "infrastructure," but railroads, ports, and telecommunications systems, which have many of the same characteristics, often are not. In the United States, it has become customary to adopt an ownership definition, by restricting "infrastructure" to publicly owned and financed facilities. This definition is particularly unfortunate for our purposes since it rules out, by definition, the choice between public or private ownership of facilities and public or private financing.

In this paper we concentrate our attention primarily on infrastructure that supports the shelter sector and urban development. When housing is built, more than land and a superstructure is needed. Adequate housing requires access to safe drinking water supplies, a sanitary means of disposing of wastes, and a means of transportation for getting to and from work, schools, and other locations. Modern urban life requires access to electricity. There must be protection against river flooding and landslides. The capital facilities that provide these and other basic services can be grouped together as infrastructure complements to housing and land in shelter provision.

Recent studies have demonstrated, in fact, that infrastructure is especially critical to national shelter development. Given access to land and credit, individual households generally can build housing on their own--either by contracting with a private supplier or by incrementally constructing a unit themselves. However, in urban settings it is almost impossible for a household to develop its own infrastructure support. These are community responsibilities, which require joint provision of services to an entire population. Some type of collective financing also is required.

In countries where careful estimates have been made of the investment needed to close the shelter gap, more than half of total investment need for lower income households has been found to consist of infrastructure spending, rather than spending for land and housing structures. The magnitude of the infrastructure gap may be illustrated by the Bombay slum of Dharavi, where nearly half a million people have access to only 162 public water taps and 842 public toilets, many of them unusable, or by the basic water and road systems of sub-Sahara Africa, which because of neglect of maintenance and repair, are in significantly worse condition today than they were 25 years ago.

Traditionally in developing nations, the largest part of infrastructure finance has been provided by central governments. This model of finance has never been fully satisfactory, as attested by the large (and growing) infrastructure deficits in most countries. Experience has shown it to be particularly weak in providing steady, reliable investment budgets that can finance projects outside the capital region, provide for maintenance as well as for initial construction, and grow over time with inflation and population growth.

In recent years, the financial flexibility of central governments has been further weakened by the burdens of international debt repayment and the steep decline in new capital inflows. In the face of this fiscal stress, it is unrealistic to look to central governments, drawing on general taxes, to finance the magnitude of additional investment that will be necessary to overcome today's infrastructure deficits.

It is the principal purpose of this paper to examine infrastructure financing alternatives and to outline a set of financing arrangements that can sustain the infrastructure investment needed to support the urban development. Such a financing system should both generate higher revenues for infrastructure investment and do so in a way that supports the efficient functioning of markets.

II. THE PUBLIC ROLE IN INFRASTRUCTURE PROVISION AND FINANCE

The basic premise of the USAID shelter policy today is that governments should gradually remove themselves from direct housing provision and become, instead, expediters and facilitators of private housing markets and private and community-based housing production. This strategy recognizes, first, that the resources needed for housing investment vastly exceed those available to government; and, second, that government efforts to fill part of national housing needs on a highly subsidized basis have distorted markets within the shelter sector, and in some cases have created financial-market distortions that reach throughout the economy.

Infrastructure support for shelter traditionally has been viewed as more clearly a public responsibility than housing itself. As the Global Shelter Strategy points out, many infrastructure services cannot be bought and sold by individuals on the private market, as housing can, making it necessary for there to be some type of collective provision and financing.

The "public" nature of infrastructure, however, deserves closer consideration. Most infrastructure functions involve a number of fundamentally different tasks. These may traditionally have been bundled together in a single, publicly provided service, but the justification for public intervention, and the type of intervention that is called for, can be quite different, depending upon the task to be performed. An examination of the theory behind the public role in infrastructure therefore makes a good starting point for considering what public policy should be toward infrastructure financing.

MARKET FAILURES

It is well known that under certain conditions the free functioning of competitive markets produces productive and allocative efficiency in the economy. In market economies, there is a presumption that goods and services should be provided through private markets unless special circumstances dictate otherwise. The case for a public role in infrastructure provision and financing, therefore, typically is made by identifying the market failures that are likely to result from producing and selling infrastructure services on private markets like other goods.

Natural Monopoly

Historically, the most powerful argument for public provision of infrastructure has been that many infrastructure services constitute natural monopolies. That is, they are capital-intensive services that face declining marginal costs over very large ranges of service provision. Under these conditions, it is more efficient (i.e., less costly) for a single producer to supply the entire market, taking advantage of the potential cost savings, than to have several

competing producers split the market. For example, it may well cost less to supply a region with electricity from a single large generating source than from many small plants, or to supply a city with drinking water from a single large reservoir than to attempt to develop several smaller reservoirs or have each household drill its own well.

When cost conditions and technology fit this model, a private monopolist generally will emerge to provide the service, given unregulated private markets. Although the monopolist can capture the cost advantages of consolidated production, he also is in a position to exploit his monopoly. He will maximize profits by charging customers a higher price than the marginal cost which is economically efficient. As a result, the service will tend to be undersupplied in the private market. That is, the monopolist will limit access to the good to those who are willing to pay the profit-maximizing price rather than provide larger quantities at marginal cost, as is economically efficient.

This line of reasoning frequently has been used to justify public ownership and operation of basic infrastructure systems, like water, wastewater, telephone, and electricity systems, as well as bridge and road networks. These are viewed as capital-intensive activities with declining costs. It therefore is efficient for them to be owned and operated by a single party. A public operator can ignore profit maximization and provide the service at marginal cost to all consumers who can efficiently use it.

The natural monopoly argument also has direct implications for infrastructure financing. As long as marginal costs continually decline with scale of production, there is no price which will both satisfy economic efficiency, which requires marginal cost pricing, and generate enough revenue to recover the full costs of capital investment (which requires at least average-cost pricing). Under these conditions, the economically efficient solution is to supply the infrastructure service below (average) cost, while relying on general tax revenues to subsidize consumption and pay for new investment. As a consequence of marginal cost pricing in this environment, a state-owned enterprise operating an infrastructure system will always be in deficit from its own operations, and unable to finance maintenance or new investment from the earnings it generates.

Does the natural monopoly case accurately describe modern infrastructure systems? In many critical respects, it does not. Infrastructure networks may historically have enjoyed declining marginal costs, helping to explain the predominance of the public sector in their ownership and operation, but today's cost structure looks different. Empirical research in the United States (Weiss 1975) has demonstrated that most electricity systems, for example, now face rising marginal or incremental costs. These systems are operating at or near full capacity and can be expanded only by using more costly means of generation. It often is just as cost efficient to add many small generating sources to the electrical grid as to expand the capital-intensive main generating source, especially if environmental hazards are taken into account. In most developing countries, the marginal costs of service expansion for large water systems also appear to be steeply increasing. New customers in Lima, Peru (to take one example) have to be served by water brought in by aqueduct from distant sources; the incremental costs of

water service there, and in many other large cities, greatly exceed average costs for current consumers.

The argument that public utilities have to be operated at a loss, in order to achieve allocative efficiency, is not borne out by the nature of contemporary cost curves. As long as marginal costs increase with output, as will generally be true in cases where capacity limits have been reached and investment in new sources is required, economically efficient pricing also will be able to recover the costs of capital, easing the financial burden of capital accumulation. This means that water or electricity suppliers can be asked to generate internally the funds that are needed for investment.

The implications of the existence of capital-intensive infrastructure systems for incremental service provision also need to be re-thought. In almost every case, it will be economically efficient to continue to operate these large-scale systems. However, where there is no excess capacity in the current system, a careful comparison of the costs of alternative ways of expanding capacity should be undertaken. It may be cheaper and more efficient to add to the city water system through a series of communal wells, each serving a new development, than by building a new central reservoir; just as it may be more efficient to service the wastewater needs of households through on-site measures than by expanding central collection and treatment capacity. These are always empirical questions. A capital-intensive technology already in place is likely to confer only a short-run natural monopoly, until capacity is fully utilized.

Where many smaller production sources can compete economically with centralized supply, other institutional arrangements than a single public supplier become feasible. Communal water sources, for example, may be financed and operated by private developers, or by neighborhood organizations, as well as by a central water authority, without loss of theoretical efficiency.

Finally, even where there is a pure monopoly, economic efficiency can be achieved by other means than public ownership and operation. One option is to have public regulation of a private monopoly. Another option is to have competition for the franchise rights to operate the monopoly, with the physical assets remaining in public ownership or being transferred for a limited duration with the franchise. For example, the Ivory Coast has assigned operation of its water system to a private firm under public control. As long as franchise rights are contestable, franchise agreements granting exclusive control over a market can achieve the same benefits as competition in production (Baumol et al. 1982).

At the distribution level, it is clear that for network services there are efficiency gains from having one firm or institution provide all service to a given geographic area. Otherwise, there will be wasteful duplication of networks. This argues for having either public sector operation or exclusive franchising of local water and electricity distribution or wastewater and trash collection. Natural monopolies at the local or neighborhood level, however, are fully

consistent with competition among potential suppliers for the franchise rights to operate the network.

Externalities

Some infrastructure services generate "external" benefits for others than those who consume them. These goods, too, will tend to be under-provided in a private market where each consumer voluntarily and individually decides whether to purchase them. An illustration of the impact of externalities in developing countries is the difference between urban household demand for piped water supply and connection to piped waste removal systems. The benefits of on-site water delivery are almost entirely captured by the consuming household: water provision cuts down on household time spent fetching water; it typically improves the quality of water consumed; and may cost much less than water purchased from neighborhood vendors selling from tanker trucks. Community surveys in countries all over the world have found urban households without access to piped water willing to pay for the costs of connection and local distribution. In contrast, households very often are unwilling to pay the costs of hooking up to sewerage networks. One important reason is that many of the benefits of sanitary waste disposal are captured by others, or by the community at large, rather than by the household paying for the connection. A sewer hook-up may avert the runoff of foul waters onto the property of downhill neighbors, and will improve general public health, but the direct benefits to the household itself are typically far less. These diminished direct benefits are reflected in less willingness to pay. If decisions about wastewater collection were made individually on private markets, there would be an undersupply of such services.

Infrastructure usage also can impose external costs on other users. Perhaps the most important example of such costs is the congestion cost imposed on others by each user of the local road network, particularly during peak travel periods. The failure to internalize these costs will lead to over-usage of road networks, relative to optimum levels, as each user takes account only of his private costs, not those imposed on others by his driving.

External benefits and costs do figure prominently in urban infrastructure services. However, there are adjustments that can be made in private markets to bring such services into line with optimal provision levels. If service prices are increased to reflect external costs (through taxes or service surcharges) and lowered to reflect external benefits (through tax incentives or price rebates), regular market operations can produce optimal outcomes.

In general, it will be efficient to use markets to allocate and finance infrastructure services for all services without externalities, as well as for other infrastructure services where approximate corrections can be made to adjust for the externalities that are present.

Nonexcludability and Free Riders

Many infrastructure systems suffer from a third market defect. It is impossible or impracticable to exclude persons from using the service, whether or not they pay for it. This

"nonexcludability" makes it impossible to set up regular private markets. Commonly cited examples of infrastructure systems of this type are local roads and public lighting systems. It may be logically possible to charge users for these facilities and to exclude from consumption those who don't pay, but it normally is impracticable to do so. In practice, it may even be difficult to exclude nonpaying consumers from services such as water distribution. In some parts of the world it is common to have "pirate tapping" of water mains and electricity lines.

In such cases, consumers may refuse to pay for the infrastructure service, relying upon their ability to obtain it free of charge, once the service is provided for others. This, in turn, will lead a profit-maximizing firm to under-supply the service. In making its supply decisions, it will take into account only the customers who are willing to pay, not those who will benefit from the service without paying, as would be required for setting economically efficient levels of production.

One response to this situation has been for local public authorities to provide such goods and finance them from general resources. Decisions about the optimal level of output then become a public sector judgment about the benefits that a road network, say, will bring relative to its costs.

There are, however, other mechanisms that retain the discipline of the market while acknowledging the need for collective choice. For example, all of the households that would be served by a neighborhood road system can be asked to vote "yes or no" as to whether they favor its construction and would be willing to pay the costs of construction. The decision whether or not to build the road will be decided by majority vote, or according to whether some other threshold level of community support is received (say 75 percent). In the event that construction goes forward all households will be required to pay their share of the costs. This arrangement removes the possibility of free-riding, and thereby eliminates the incentive to under-report one's willingness to pay for the project, as well.

In this case it is the collective decision-making arrangement that is critical. The service itself could, in principle, be provided by a public authority, a neighborhood association, or a private firm.

OTHER REASONS FOR A PUBLIC ROLE

Subsidization of Low-Income Consumers

Private markets are based on providing goods to those customers who are willing and able to pay for them. However, many shelter-related infrastructure services are regarded as so fundamental to human life that they need to be provided, regardless of household economic capacity. Access to safe drinking water, sanitary waste disposal, protection from landslides and flooding, and basic transportation may all fall within this category. This line of argument has been used to justify public provision of infrastructure services on the grounds that public

suppliers can afford to provide services when it is socially desirable, whereas private suppliers cannot. A public supplier implicitly can draw on general tax revenues when fees and charges from users prove inadequate, and it can, in principle, effect a socially desirable cross-subsidization even within service delivery, by charging high-income consumers more than the cost of service provision while charging low-income consumers less than costs. Such pricing would not maximize profits for a private (unregulated) monopolist, and could not be sustained under competitive private-market conditions (where new entrants would skim off the high-income customers thereby eliminating the possibility of cross subsidy).

Once again, however, it is important to distinguish just what type of public intervention is required to meet the objective of support for low-income consumers. The requirement that pricing reflect cross-subsidization of poor households can be written into the terms of regulation or franchising through which the public sector oversees a private monopoly supplier. Alternatively, even in a private, competitive market the public sector could reimburse all producers for a government-mandated reduction in the fees charged to targeted, low-income consumers, or could subsidize such consumers directly. That is, publicly financed or publicly prescribed subsidies do not necessarily imply public ownership or public operation of infrastructure facilities. SODECI, the Ivory Coast private monopoly supplier of water services, for example, is required to operate a dual pricing system in which urban consumers subsidize consumers in rural areas and small towns.

Public Development Objectives

Government frequently has an overall pattern of urban development that it wants to encourage. This pattern may be economically motivated, by the desire to distribute population in a way that will reduce long-run costs or exploit potential natural resources, or it may be motivated by other types of considerations, such as the desire to increase national security through a certain type of urban development. Infrastructure investments are probably the most effective tool that governments possess for steering urban development, both at the regional and local scale. An unregulated private supplier will not take national policy objectives into account in deciding where or how to provide infrastructure networks, unless these coincide with profit opportunities. The need to more actively guide the process of urban development can justify direct public investment at strategic points.

There is a similar public interest in monitoring and controlling the indebtedness that infrastructure suppliers compile, especially external indebtedness. Infrastructure systems are large users of capital. In the past, some private firms and state-owned enterprises have borrowed heavily on foreign markets to finance infrastructure projects, then found themselves unable to make repayment. Sometimes this borrowing is guaranteed by government. Even when there is no government guarantee, there is a national interest in external debt payments, which may affect foreign exchange rates and national development plans, or jeopardize future inflows of capital.

On the surface, debt considerations may seem a powerful further reason for direct government financing and provision of infrastructure. In practice, however, state-owned enterprises and government agencies have been the most extravagant in incurring debt for capital projects. Government's legitimate interest in controlling foreign borrowing may best be achieved by a system of review and control for all major capital projects that require foreign exchange, rather than through ownership of the largest borrowers.

CONCLUSIONS: THE PUBLIC ROLE IN INFRASTRUCTURE

There is no doubt that the public sector should retain an important role in infrastructure finance and in the provision of infrastructure services. This relationship sets shelter-related infrastructure apart from housing. However, economic efficiency usually does not require a specific form of public intervention. In particular, public ownership, operation, and direct financing of infrastructure systems often is not necessary.

We have emphasized in this section the market failures that make a public role appropriate. However, there are also failures of government. There is a large body of literature on why governmental bodies might seek objectives of their own, separate from the priorities of citizens, in order to increase the power of a bureaucratic agency or ease the working life of government employees. The financial and production record of state-owned enterprises around the world strongly suggests that there are likely to be inefficiencies of operation when public organizations are freed from the discipline of financing their own operations or responding to the market demands of customers.

In tackling shelter-related infrastructure deficits, it is desirable to draw on market discipline and market financing as much as possible. This objective may be met by devolving investment responsibilities to lower levels of government that are better positioned to gauge citizens' investment priorities; it may be met by turning over selected investment responsibilities to the private sector, under public guidelines or regulation; or it may be met by revamping the price incentives and financing of government enterprises to make them more responsive to markets. From this perspective, the task is not unlike that facing governments in the provision of housing: they need to become imaginative facilitators of infrastructure markets rather than replace markets with public actions. The public role in the infrastructure sector, however, always will remain substantial.

III. CHARACTER AND MAGNITUDE OF THE INFRASTRUCTURE FINANCING GAP

The design of an infrastructure financing strategy must be shaped in part by the character and magnitude of the capital investment to be carried out, and by the size of the financing gap (i.e., the difference between investment needs and currently available financing).

Developing country infrastructure investment needs fall into three broad categories. First, there is the investment needed to accommodate population growth and new household formation. This refers to the extensions and expansions of infrastructure services needed to support new housing. Second, there is the catch-up investment needed to expand infrastructure coverage rates among the existing population. This investment involves bringing water, roads, waste removal and other services to those now living without them. Finally, there is the investment needed to replace, repair, and maintain infrastructure facilities that are already built and in service. In many places, this last need has become acute because of long histories of deferred maintenance that threaten the very survival of critical capital facilities.

All three of these infrastructure needs are now very largely needs for urban investment. Most of the new population that will require infrastructure services will be housed in cities or their environs. According to United Nations projections, between 1985 and 2020, 82 percent of all population growth in less developed countries will take place in urban areas. The urban population is projected to grow by a total of 2.28 billion people over this period; that is equivalent to a new urban population, the size of the entire United States, every 3.5 years. The new population will have to be provided with connections to infrastructure networks, and the networks themselves will have to be greatly expanded, often at steeply rising incremental costs.

Coverage rates for infrastructure services, such as piped water, sewerage and electricity, are generally much higher in urban areas than in rural locations. Despite this, much of the investment in upgrading coverage also will be urban. Rural households often have localized alternatives to capital intensive networks. They can obtain water from wells and dispose of wastes through latrines. In cities, there are fewer possibilities of substitution for capital networks. Even where on-site solutions are not feasible (e.g., electricity and roads), national development standards may conclude that it is economically infeasible for the rest of this century to provide network coverage to highly scattered rural populations. Cost-effectiveness will dictate that coverage ratios remain higher for the urban population.

Finally, the aging infrastructure systems needing repairs are almost all urban. Many of these were built during the colonial era, but have suffered from neglect of maintenance and ordinary repairs. As large as the costs of rehabilitation are today, they will only escalate if

maintenance and repair continue to be neglected, and basic urban network systems have to be rebuilt in their entirety.

ESTIMATES OF FINANCING NEEDS

The total cost of urban infrastructure investment needs has been computed by some observers to be so high that it is utterly infeasible to meet them, unless drastic measures are taken to prevent rural to urban migration. Prakash (1982, 1977), for instance, concluded that the housing and infrastructure required to service the additional migrants expected to come to Asian cities over the next 20 years would exceed the investment capacity of these countries, even if all domestic savings were mobilized for this purpose.

More careful estimates of investment requirements have modified this pessimistic conclusion. They reveal that there is a substantial variation among countries in the size of the gap between infrastructure "needs" and the resources plausibly available for investment, as well as a large potential in almost all countries for reducing investment costs by adjusting infrastructure standards.

Richardson and his colleagues have prepared probably the most thorough estimates of the costs of providing infrastructure to the growing urban population (see Table 1). These costs then were related to the pool of resources potentially available to finance all domestic investment. The aggregate pool of resources available for investment was estimated by projecting national economic growth rates and historical or target ratios of domestic investment to GNP. "Infrastructure" is defined broadly to include almost all local investment needed to support the residential sector, excluding costs of job creation. The investment"need" totals refer to amounts needed for the urban population only; they incorporate what the authors regard as reasonable reductions in the government's standards for housing and infrastructure services for the poor.

Although large, these investment needs, which include direct investment in housing, are not beyond the capacity of the respective national governments. The predicament of Pakistan, which faces the most severe financing bind, is a result of the combination of a high projected urban growth rate (4.9 percent per year) and a low overall rate of gross domestic investment. The ability to mobilize national resources for all investment, in fact, turns out to be one of the greatest differences between countries in explaining the severity of the shelter resource gap. It reminds us that any measures taken to improve infrastructure financing must be consistent with national policies to increase aggregate savings and domestic investment.

Once the needs for direct housing investment have been adjusted to reflect the building standards actually used in low-income housing markets, infrastructure is found to account for a very large part of total shelter-sector investment need. In the study, from which the Egypt projections in Table 1 are drawn, it was estimated that for new, lower income settlements in the Greater Cairo area infrastructure costs represented two-thirds of the total cost of housing

plus infrastructure, whereas in the Greater Alexandria area, the infrastructure share of total shelter costs for low-income residents rose to almost 80 percent. Cost allocations for Indonesia are comparable. By far the greatest part of infrastructure costs, in turn, are associated with general system

Table 1

Estimates of Infrastructure Investment Needed to Serve Population Growth

Country	Per Capita Urban Housing and Infrastructure Cost	Urban Absorption Cost as percent of Total Resource Pool	Per Capita Cost in Years of Median Urban Per Capita Income
Bangladesh	$ 480	42.1%	2.9
Egypt	2,598	28.6	2.8
Indonesia	1,197	14.6	1.2
Pakistan	1,603	50.8	4.3

Source: Derived from Harry W. Richardson, "The Costs of Urbanization: A Four-Country Comparison," Economic Development and Cultural Change (April 1987), pp. 561-580.

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expansion, rather than with household connections. For example, in Jakarta the per capita costs of building new dams and installing new treatment facilities and trunk distribution lines for the water system were estimated to run 40 times the costs of site-specific hook-ups and local distribution.

From a cost perspective, then, urban infrastructure is more than a necessary adjunct to housing in a national shelter strategy. In responding to the needs of population growth, it typically will place even greater demands on resources than does direct investment in housing, especially for those in the lower half of the income distribution.

Estimates of the resources needed to expand infrastructure service coverage among the existing urban population are also large. The International Safe Drinking Water and Sanitation decade set the goal of providing universal access to safe drinking water and waste disposal by 1990. According to World Bank projections, achievement of this goal--even after lowering service standards from those now nominally in effect--would require investment of more than $40 billion (current dollars) per year for a decade, or roughly tripling the real rate of present investment in the water and sanitation sector. Water coverage rates in urban areas currently range from less than 60 percent in East Asia and the Pacific to 78 percent in Latin America and the Caribbean, with great variations among countries and individual cities.

The magnitude of investment needed to preserve, repair, and restore old infrastructure networks is perhaps the most uncertain element in today's financing deficit.

The World Bank estimates that $45 billion of road infrastructure has been lost because of maintenance neglect in 85 developing countries over the last 20 years. It projects that $9 billion per year for the next decade will have to be spent to make economically warranted repairs to the existing road system. This figure is about 30 percent higher than current spending on road restoration and maintenance, although the repair problem is far more severe in selected countries.

THE INFRASTRUCTURE FINANCING GAP IN PERSPECTIVE

Great precision should not be read into any of these quantitative estimates of infrastructure investment need. Together, however, they paint a consistent picture. The implications for financing shelter-related infrastructure may be summarized as follows:

o Meeting all of the needs for shelter-related infrastructure within 12 years will require very large increases in investment levels, even if infrastructure standards are lowered. This is a goal that in all probability cannot be met literally. A more feasible, yet still very challenging goal is to put in place by the year 2000 a self-sustaining finance system and institutions that are in the process of eliminating these deficits.

o There are competing demands for domestic investment in developing countries, particularly to sustain production growth. The financing mechanisms chosen for infrastructure support, therefore, should encourage greater domestic savings and investment, rather than merely divert resources from other investments.

o Every country will have to establish priorities within the infrastructure investment budget. In many cases, this will require ensuring, first, that existing infrastructure systems remain serviceable before launching new construction projects and, second, seeking less capital-intensive ways to provide adequate services.

o It is a paradox of infrastructure service provision that, despite large gaps in coverage, some segments of the population consume far more services than is economically efficient, because of widespread price subsidies. Infrastructure financing mechanisms that utilize the market can, and should, restrain consumer demand, thereby permitting reductions in investment need, at the same time they generate resources for investment.

IV. THE PROSPECTS FOR INFRASTRUCTURE FINANCING

In most developing countries, infrastructure financing is now seen as primarily a central government responsibility. In a survey of public investment and expenditure reviews performed by the World Bank, VanDomelen (1988) found that municipal governments and local public authorities accounted for only 2 percent of sectoral public investment in the Philippines, 5 percent in Tunisia, and 15 percent in Turkey and Brazil, which have developed special institutions to encourage investment at the local level. The dependence upon centrally raised revenues is still greater, since part of local expenditure is financed by grants and transfers from central government.

The extreme dependence upon central revenues contrasts with urban infrastructure financing in the United States, the Federal Republic of Germany, and even centralized European states like Great Britain. There, a much greater share of infrastructure investment and financing responsibilities has been decentralized to local governments or local authorities.

CENTRAL GOVERNMENT FUNDING

Central-government revenues have proved to be a precarious base for third-world financing of infrastructure spending. For most of the last decade, public sector budget deficits have run high. These reached their peak, as a proportion of Gross Domestic Product, in 1982, necessitating programs of public expenditure reductions in many countries. The international debt crisis further exacerbated the pressure on central-government budgets by increasing debt-service costs, at the same time it reduced external capital flows, many of which traditionally have been used to finance infrastructure investments. For all developing countries as a group, the share of interest payments in government budgets and in GDP more than doubled between 1975 and 1985. For the group of highly indebted nations, interest payments soared by a factor of 8 times relative to total government spending and GDP, reaching more than 8 percent of GDP in 1985. The financial imbalances triggered by these debt burdens have led in many cases to severe retrenchments in central-government spending, either at the initiative of national government or under conditions imposed by international lending agreements.

Capital spending and spending for infrastructure services, in particular, have been singled out for budget cuts. A survey of 25 developing country budgets (Hicks 1988) found that while real current spending by central governments was cut back 7.8 percent, capital spending declined by 35.3 percent. As between sectors, infrastructure spending, for both capital and current purposes, fell most steeply--some 27 percent. This far outpaced the cutbacks experienced in any other sector. (Military spending was the least affected by budget retrenchment.) The budget data are consistent with previously reported findings for most developed countries: in times of government spending reductions or revenue uncertainty, it is capital investment and facility maintenance that are cut most sharply. Governments often

hope that the budgetary pressure will be temporary, in which case spending on capital projects can be halted and resumed more easily than spending on social programs or defense. The effects of maintenance neglect, moreover, do not become visible immediately, and there is a natural tendency to absorb budget reductions in functions where the adverse consequences take the longest to reveal themselves.

In the current economic environment, the retrenchment in infrastructure investment is unlikely to be temporary, however. Debt-servicing pressures will continue to intensify. Despite spending reductions in many countries, budget deficits remain high, limiting the scope for expenditure growth. Resistance to general tax increases, both among the populace and among development strategists wanting to encourage private investment, makes it unlikely that central government budget constraints will be relaxed much in the future. Indeed, in the 30 countries where the World Bank carried out public investment and expenditure reviews between 1982 and 1987, it recommended on average a further 23 percent reduction in public investment beyond the budgets proposed locally.

Under these conditions, it is imprudent to look to central government to finance infrastructure investment growth on the scale that will be needed to meet the goals of the Global Shelter Strategy.

AN ALTERNATIVE FINANCING FRAMEWORK

If central government cannot provide the resources, where should these be drawn from? In general, an infrastructure financing strategy will require shifting part of the cost burden to three groups:

Individual Beneficiaries

Consistent with market principles, those who benefit directly from infrastructure investments should pay for them, as long as the benefits exceed the costs and there are not large externalities. Most beneficiary charges do not require a tradeoff between efficiency and revenue generation, since the same charges that clear markets can generate investment funds. For typical local infrastructure projects, there will be two classes of beneficiaries: consumers, and landowners within the service area. Mechanisms need to be identified for efficiently recovering capital costs from both these groups.

Local Governments

For most shelter-related infrastructure, "public" benefits are captured in full at the local level. From an efficiency perspective, this makes local government the appropriate level for setting investment priorities and financing general infrastructure costs. Depending upon the service involved, "local" government may extend as far as the entire metropolitan region, or be as limited as the coverage area of a single neighborhood association.

Local governments have their own set of revenues most suitable to finance local budgets. Tapping these revenues lends an element of diversification to infrastructure finance. However, the primary reason for believing that a shift to local financing will enhance infrastructure spending is the greater value that local citizens, and local government representatives, appear to place on shelter-related infrastructure works, relative to central governments.

Future Generations of Users and Taxpayers

Roads, water and sewer systems, and other public works can reasonably be expected to last 60 to 100 years if properly maintained. Therefore, future generations of users will benefit from today's investments as well as today's users.

If investment continued at a roughly constant rate over time, relative to national population size or income, each generation could benefit in approximately the same degree from capital installed by earlier generations, and each could bequeath to its successors a capital stock that had been enhanced to roughly the same degree by its efforts. In this steady state, investment could be adequately financed (except for the inevitable lumpiness of major projects) from current revenues. If a national commitment is to be made at one point in time, however, to catch up on past investment deficits, or to expand coverage rates, the cost burden of pay-as-you-go financing will be much heavier for today's population than for either past or future generations. Under these conditions it is equitable and efficient to spread part of the costs of capital investment over different generations, by using debt financing. Borrowing through debt issuance makes it possible to gather greater amounts of capital, while allocating the costs of investment to all beneficiaries, including those who will use capital facilities in the future. Borrowing can be abused, of course, if it is used to shift even the normal investment costs of the present generation to the future.

In the next section of the paper, we first consider the technical and financial vehicles that can be used for efficient revenue generation from the above groups. We then examine the institutional context in which the revenue principles have been successfully implemented in different countries.

PART 2

INFRASTRUCTURE FINANCING OPTIONS

In this part, we turn to a closer consideration of the options, beyond central-government, general budgets, for financing shelter-related infrastructure. Our purpose is to identify financing mechanisms that make economic sense, and to understand the institutional and practical context in which they have been shown to be most likely to succeed.

I. SELF-FINANCING THROUGH USER FEES

As we have noted, well-designed user fees can allocate infrastructure services efficiently at the same time they generate revenues to finance investment budgets. Increasing user fees to economically efficient levels should be the first priority of an infrastructure financing strategy.

How great is the revenue potential from user fees? Various studies suggest that a large part of the capital budget for shelter-related infrastructure could appropriately be financed through user charges. In a recent examination of user-fee potential in sub-Sahara Africa Anderson (1987) estimates gross investments in infrastructure (water, electricity, telecommunications, and roads) at $6 billion in 1987, and estimates the current value of the stock of infrastructure capital at 12 times that amount, or some $72 billion. If a more aggressive public pricing policy were able to increase the financial rate of return from these assets by 5 percentage points, it would generate an additional $3.6 billion in revenue annually and make possible roughly a 60 percent increase in annual infrastructure investment, even without taking into account the borrowing that this revenue revenue stream could leverage. An increase in user fees on this scale would add roughly a quarter to the total revenues of government.

PRICING POLICY

Economic theory recommends setting the prices or user fees for infrastructure services equal to marginal supply costs. If current infrastructure capacity is insufficient to meet future service levels, marginal supply costs must reflect the costs of adding to capacity, as well as the marginal costs of operation.

There has been a good deal of debate in the economics profession about how best to incorporate expansion costs into service pricing. However, a straightforward procedure that captures the essence of the economic analysis is Average Incremental Cost (AIC) pricing. AIC simply identifies the capital costs that must be incurred to expand capacity over some planning period, and converts these to a per-unit-of-output basis. That is, AIC pricing sets fee levels equal to the average capital cost of expanding output, discounted to the present, plus the marginal costs of operation.

Note that, if the sums have been done correctly and revenues owed are actually collected, AIC pricing will necessarily generate enough revenue to pay for future planned capital

investment. If incremental capital costs are rising--as is generally the case--AIC also will generate enough revenue to cover historical financial costs, plus generate a financial surplus. That is, infrastructure systems where AIC pricing is appropriate should be able to cover their operational and maintenance costs, debt service, depreciation, an adequate return to capital, and a financial surplus. This surplus can be made available to help finance general government, or be used to fund subsidies for low-income consumers. From time to time water or electricity systems have been used in just this way by developing countries. For example, the Nairobi water system in the past charged rates approximately equal to AIC; the cash surplus then was "borrowed" by the Nairobi City Council for general government financing (Buhl and Linn, forthcoming).

The user-fee model of financing may, of course, break down in implementation. If revenue collection is spotty, even the optimally designed set of user prices will result in a shortfall in the investment budget. Moreover, efficient pricing in the present is no safeguard against the inefficiencies of past investment. If past miscalculations led to excessive additions to capacity, or to wastefully costly sources of supply, efficient pricing, based on future incremental costs, may well produce financial losses for a system still saddled with the consequences of past investment decisions.

For many network systems, it is important to distinguish the capital costs of connecting more users to the system (through pipe or wire connections to houses) from the capital costs of expanding the capacity of the system as a whole (through expansion of generation, treatment or production facilities and trunk distribution lines). The latter costs are properly viewed as incremental capital costs to be shared by all users, and should be incorporated into the construction fee structure. The benefits of house or lot connections are captured in full by the individual user, and thus are most efficiently separated out as a special connection or hook-up fee paid by the user. When an entire neighborhood receives new service, the costs of extending distribution lines to the area may also be allocated to the new users through connection fees. (Note that if household connection to the local distribution system is voluntary, a distinction should be made between the neighborhood development charge and the household connection charge. The former should be a mandatory charge, paid by all neighborhood residents, and covering the costs of bringing the service in question to the neighborhood. The latter should cover only the incremental cost of connecting a particular house to the neighborhood distribution system, and should be paid only by those choosing to connect.)

The successful application of user fees also requires a convenient way to measure individual consumption. Water or electricity meters are one obvious measurement device, although these need to be designed for durability, simplicity of reading, and resistance to tampering. Where meters have not been installed, or where direct measurement of usage is infeasible, other proxy measures of consumption may be utilized. In water distribution, household water consumption may be approximated by the diameter of the household pipe connection. In the transportation sector, a government surcharge on automobile fuel, though

labeled a tax, serves as an approximate user charge for use of the government-installed road system.

DRINKING WATER

The implementation issues surrounding user fees may best be examined in the context of specific services. We use water delivery and road usage as illustrative of different types of services suitable for user pricing.

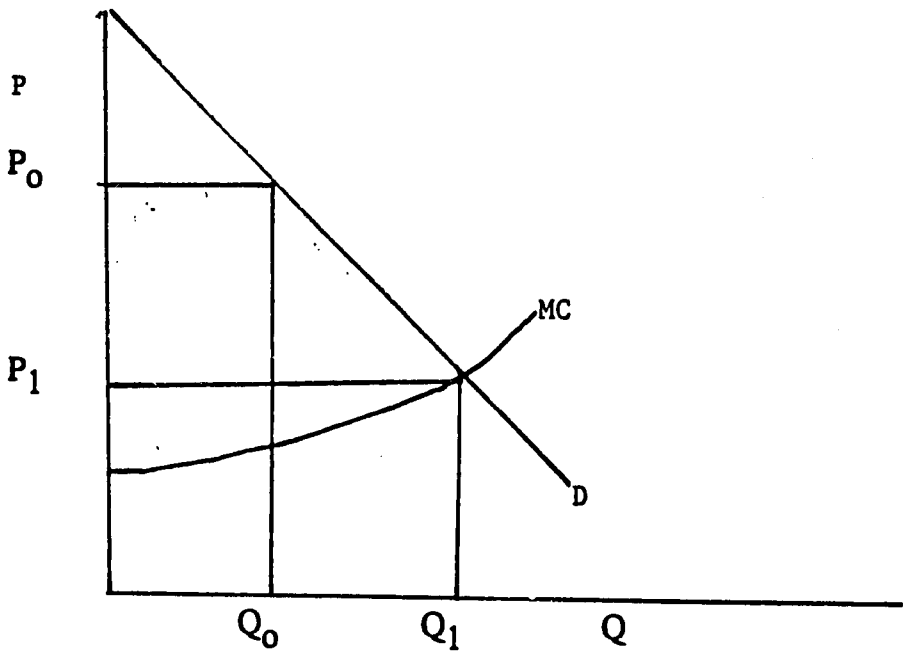
One of the most pressing priorities of the shelter sector is to provide safe water connections to those moving into urban areas, and to expand water coverage among the urban residents, mostly the poor, who do not have access to potable water.

Assume that Figure 1 represents the demand for water consumption of a typical household in an area unserved by public water supply. The curve MC shows the system's marginal costs (incorporating average incremental costs for system expansion). If publicly supplied water is priced at marginal cost, it will carry the price, P_1. The line marked P_0 represents the Vendor Price for water sold from tanker trucks to consumers in the neighborhood. Where neighborhoods are fully dependent on tanker trucks, surveys have shown the price per liter of water to be 3 to 25 times the public tariff charge in different large cities, and perhaps 2 to 10 times the full marginal costs of distribution from the public system. Note that because of the high vendor price, the household consumes considerably less water, Q_0, than it would if served by the public system, Q_1.

Whether or not it is in a household's interest to pay the cost of hooking up to the public water system is a straightforward instance of cost/benefit analysis. The shaded area

Figure 1

Drinking Water Demand and User Pricing



in the diagram represents the value to the household (or consumer surplus) of gaining access to the public distribution system, given that the authority follows marginal cost pricing, and that it presently gets water from private vendors. Note that if the public authority subsidizes the price of water, by pricing it below marginal cost, the household would be willing to pay still more for connection to the public system, because it is gaining access to a consumption stream provided at a discount.

If the full cost of connection to the household is less than the shaded area, the household will be better off paying for a connection; if the connection cost exceeds the shaded area, it will be better off continuing to buy from private vendors at a higher per-unit price but avoiding the one-time expense of the connection charge. As long as water consumption is priced at marginal cost and connection charges are set at the actual costs of connection, there will be an optimal allocation of water supplies.

This illustration suggests how connection fees and collective decision making can be used to carry out a household water connection policy. If the water authority charges a connection fee that recovers its full costs, it can expand coverage without recourse to outside resources. Most coverage expansion will involve bringing new sections of the metropolitan area into the water network. Therefore, the decision whether to pay for connections must be made collectively by each neighborhood to be served. A neighborhood vote on whether to pay for connection fees is the appropriate way to make this choice. A full menu of service choices and installation fees should be placed before neighborhood groups. For example, if standpipe service is available at a much lower charge, they may opt for this solution.

Tegucigalpa, Honduras has recently introduced a self-financing water connection program of this kind with USAID funding. Households in an area without water distribution are first visited by community development planners from the municipal government. The possibility of connecting to the public water system is explained to them, along with the costs to be charged, and the benefits, in terms of safer water and greatly reduced fees for water consumption. Households then vote through the neighborhood association (or patronato) whether or not to participate in the connection program. In this case, donor financing is used to set up a revolving fund to lend households part of the capital cost of connection, with repayment to be made over a three-year period. Both the patronato and the individual beneficiaries pledge repayment. The program is rapidly expanding water coverage in poor neighborhoods, where demand for participation has been high. Unfortunately, however, the growth in service connections has contributed to system-wide water shortages so that the connection program has had to be slowed until the new water supplies now under development come on line.

Collections and Subsidies

If user fees are to be utilized for capital financing, there must be a vigorous policy of fee collection. In principle, services like water and electricity lend themselves to collection enforcement, since household access can be shut off for those who do not pay. Where the

political will exists to pursue payments, collection rates are, in fact, high. The national water authority of Panama, for example, has been used as the collection agent for other locally owed fees and taxes, since shut-off of water connections is viewed as the most credible threat that the public sector possesses. In Bogota in the mid-1970s it was found that the rate of arrearages on water rates was less than one-tenth the rate of arrearages on installation charges for sewerage works--development charges that were levied by an agency without the power to shut off water service (Linn 1976).

Nonetheless, many water systems have unsatisfactory collection records. Sometimes these are rationalized on the basis that poor households cannot afford the fee structure, and thus vigorous collection of amounts due is undesirable. However, the question of subsidies for low-income households should be kept separate from revenue collection; any subsidy policy should be incorporated explicitly into the fee structure, rather than introduced de facto into selective enforcement of collections.

There are a number of ways in which user fees can be adjusted to take account of ability to pay. One of the most common in the water sector is the use of "lifeline" rates--i.e., rates which are set below costs for a minimum level of consumption regarded as basic to good health, then rise with further, discretionary usage. Sometimes, consumption charges are further differentiated on the basis of presumed luxury consumption. For example, In Bombay houses with swimming pools fall into a special rate category. In systems where per-unit charges rise with consumption, it is common for there to be cross-subsidization within the water distribution system. That is, rates in excess of AIC paid by some consumers are used to offset rates below AIC paid by others.

The two most important pricing issues touching upon protection of the poor concern connection fees and pricing of water delivered from standpipes. Connection charges that are set to recover the full cost of service extensions, including the off-site costs of extending main distribution lines and installing pumping facilities, can become a very costly element relative to low-income household budgets or the cost of finished lots. For example, in serviced lot developments outside Montego Bay, Jamaica, the full cost of extending water provision to the sites represented about 40 percent of the total cost of a serviced site, including land and other services. One way that government can target its infrastructure assistance most effectively is by contributing from general resources a fixed amount per household to cover off-site infrastructure costs on sites and services projects or other shelter developments aimed at the poor.

Price reductions for standpipe service are another effective means of targeting the poor population. Normally, this will not require a special subsidy, but only an accurate reflection in the water-rate structure of the lower marginal costs of supplying water through standpipes, or application of the "lifeline" pricing structure to consumption from standpipes. In some countries, standpipe pricing is now perverse, in the sense that increasing-rate block structures place standpipe usage in the highest price class, because consumption is measured as total

standpipe output, whereas consumption rates per household are very low and would place each family in the lowest price consumption block.

Differential Rates to Restrain Capital Costs

One purpose of service pricing is to restrain consumption to levels which consumers are willing to pay for, given supply costs, thereby limiting the need for capital investment in capacity expansion, as well.

Probably the most important opportunities for differential pricing in the water supply sector concern pricing to reflect differences in the cost of supply to different geographical areas. It is now the case in many large, capital regions--for example, Lima, Bangkok, or Mexico City--that incremental water supplies must be transported from greater and greater distances or, in the case of Bangkok, impose greater and greater external costs in terms of exhaustion of groundwater reserves and subsidence. It is important to give appropriate market signals by reflecting these cost differences in water charges. The Metropolitan Development Authority of Bangkok and the Government of Thailand, for example, have announced a policy of making the Bangkok region pay for itself fiscally; among other actions, this will require raising water charges to reflect the high costs of developing water sources. A surprising number of countries (including Malaysia, the Ivory Coast, and Tunisia) have established nationally uniform water charges for urban areas, thus eliminating the possibility of capturing cost differentials.

An even more significant opportunity for differential installation charges exists at the metropolitan scale. The full cost of providing water connections to households in different locations can vary drastically depending upon the distance that main distribution lines have to be extended and the density of development. Studies in Cali, Colombia have reported cost differentials of 20 to 1, in total costs per connection, and studies in Santa Cruz, Bolivia have reported differentials of 30 to 1 in the total costs of bringing water service to different settlements. It is critical that connection fee policy reflect such differences if prices are to serve their purpose of helping to channel development to where it can be efficiently accommodated.

ROAD USAGE

Road usage illustrates a quite different kind of user-fee market. First, many of the most important costs associated with road usage are external costs--costs of congestion, and costs of highway wear and tear imposed on all users by trucks. Although these costs are reflected in capital investment that becomes necessary from usage, the costs in the first instance are suffered by others than the users. Second, although some of the costs could in principle be recovered through direct charges imposed on road users, in general it is infeasible to charge directly for usage of the road system, except for long hauls on toll roads or for bridge crossings. Singapore alone among developing countries has implemented a system of

congestion charges which are levied at differential rates on all traffic entering different parts of the city. Most user fees in this sector have been imposed indirectly through taxes on fuel consumption and license fees charged for different classes of vehicles.

Newbery (1988) has shown that, in a developing country context, these indirect charges are an almost fully satisfactory substitute for direct pricing of road access. Fuel taxes serve as a proxy for road usage and become a congestion charge. It can be shown that under certain conditions--constant returns to road expansion and optimal adjustment of the road network to traffic flows--the optimal set of congestion charges will generate just enough revenue to pay for the optimal amount of investment in road expansion (Mohring 1974). If, as is generally true in urban areas, there are increasing costs to system expansion, the optimal set of road congestion charges, like the optimal set of water system fees, will generate more revenue than is needed to finance road investment, leaving a surplus for the government general fund. This also implies that fiscal planners can work backward from design of optimal road investment to the calculation of average incremental costs and the fuel tax that will be necessary to recover the incremental costs of road system expansion.

While a fuel tax can be used to pay for investment in new roads, differentiated license fees or graded taxes on tire size can be used to pay for the optimal road repair budget. The road damage caused by vehicles increases exponentially with axle weight. Therefore, a steeply rising license fee scale, in which large trucks pay the stiffest fees, is needed to relate charges to pavement damage inflicted. The optimal set of fees will generate just enough revenue to pay for the optimal timing and amount of repairs (i.e., repairs scheduled to restore surface quality at the appropriate point in the pavement lifetime). Once again, as a practical administrative matter, it is possible to establish the optimal repair program, and derive the license fees necessary to finance it.

When the above reasoning was applied to Tunisia, several alternative tax and fee schedules were derived which fit the optimality conditions and can fund the national road budget. One alternative is a fuel tax equivalent to US$.06 per liter of fuel, a 10 percent tax on vehicle parts and tires, and a graduated license fee for trucks, equal to 20 percent of the purchase price of a light truck (Newbery 1988).

INSTITUTIONAL ISSUES IN SELF-FINANCING THROUGH USER CHARGES

Key to the efficient functioning of user charges for capital finance is the assurance that rates can be set at optimal levels and adjusted to reflect inflation, while the revenues they generate are targeted for capital investment in the sector. If revenues only pass into the government's general budget, and are used to defray the costs of current government operations, the linkage that economically justifies the rate structure is severed.

The institutions that establish fee levels and handle revenues thus become critical. Independent institutions, like independent (public or private) water and sewerage companies

and electric companies, have the best record of financial self-sufficiency. They have the flexibility to adjust user charges in line with cost changes, and have the power to retain earnings to finance investment. For example, the water institutions with the best financial records and the best record of self-financed capital investment tend to be autonomous institutions, at either the local or national level. This is true of the water systems in Seoul, Korea; Bogota, Colombia; Bombay, India (since 1973) and the national systems of Tunisia and the Ivory Coast (with the best records of cost recovery in Africa). By contrast, systems which are subordinated to political control and have active political intervention in rate-setting tend to suffer from inadequate rate structures and inability to finance their own investment. This characterizes the pre-1973 water system in Bombay, the Lagos, Nigeria system (where water charges are set by the city council), and the system in Tegucigalpa, Honduras, among others. Within Bolivia, the local water utilities that are set up as cooperatives, and thus not subject to tariff reviews by the national housing ministry, have a much better cost recovery record than the utilities that are set up as public authorities, subject to ministry tariff approval.

Financial self-sufficiency, of course, is not the only appropriate objective for institutions in the water sector or for institutions providing other infrastructure services. There is some evidence that autonomous public water institutions have been more reluctant to aggressively serve low-income households, either through household connections or standpipes, because of the greater difficulties of revenue collection. When the National Water Commission of Jamaica became a semi-autonomous institution, for example, it ceased installing standpipes because it was unable to recover the costs of water supply. Linn (1975) reported a reluctance on the part of the Cartagena, Colombia municipal service agency to pursue an active investment program in low-income areas, because of the constraints of financial self-sufficiency.

The desired balance between financial self-sufficiency and public service objectives can best be struck explicitly in the charter arrangement between government and a monopoly (public or private) infrastructure supplier. This agreement should provide expressly for rate-setting that can finance the capital investment program, and allow for periodic, automatic adjustments in rates to offset inflation. It should spell out the investment responsibilities the providing institution has. In the United States and many European countries, public utilities have the obligation under their charters to be universal suppliers--that is, to provide water or electricity service to every household or firm that wants it within its franchise area. Such service standards are too high for developing-world institutions to meet in the immediate future. In their stead, specific standards for coverage rates should be identified. Service policies toward standpipe provision, connections in low-income areas, and subsidization of poor consumers should also be expressly identified.

A successful example of such an arrangement is provided by REGIDESO, the national water and sewer authority of Zaire. It recently has completed a "Contrat-Programme" agreement with the government, which carries reciprocal obligations on pricing and investment. For its part, the government has agreed to permit a gradual, 3 percent per year increase in average real tariff rates, with automatic quarterly rate adjustments in nominal rates

to offset inflation. This will allow REGIDESO a minimum 7 percent return on revalued capital assets. The government has also committed itself to reduce arrearages in government water accounts (which, as in many developing nations, is one of the most severe sources of financial strain). Government arrears are to be reduced from 27.8 months to 3.5 months of sales, by the end of 1988. For its part, REGIDESO commits itself to carry out a defined five-year investment program, which will increase urban water coverage from 62 percent to 70 percent by 1990, and increase system capacity and metering, as well. It pledges to finance at least 40 percent of capital investment from internally generated earnings.

Although it remains to be seen whether all of the provisions will be met, REGIDESO's record in administrative progress has been excellent. This type of explicit, reciprocal rate and investment agreement holds considerable promise as a device that can generate investment resources, while meeting the efficiency objectives of user pricing.

II. TAPPING LAND VALUE GAINS FOR INFRASTRUCTURE FINANCE

Few aspects of urban growth in developing countries are more pronounced than the escalation of urban land values. There is rapidly growing demand for urban land, from new migrants into the cities, from natural population growth, from expanding industrial and commercial sectors, and from investors (or speculators) looking to invest in real assets that have withstood inflation. Against this robust demand is a limited supply of developable land. In some metropolitan areas, there are physical constraints on the city's expansion. However, in most areas the binding constraint is not an overall shortage of land but a shortage of serviced land--i.e., land having access to basic infrastructure services.

Under these conditions, all land prices in the urban environs will increase in price over time, but there will emerge, as well, large price differentials between serviced land and land without infrastructure services. Owners of land without infrastructure access either cannot develop their parcels for most formal-sector uses, or must bear the expense of substituting their own facilities for public networks.

Urban land price gains have been so striking that urban land ownership has become a principal vehicle for wealth generation in most developing countries. Table 2 summarizes some of the price increases for which well documented historical information is available. The average price increases reported in the table cover relatively long periods of time and are given in real terms, after discounting for inflation. More recent price changes appear to have exceeded the longer term average. During the early 1980s, for example, land prices in Bangkok grew by more than 24 percent annually in real terms.

The vast differences in prices that emerge between land with and without infrastructure services may be illustrated by Santa Cruz, Bolivia, which for the last 15 years has been one of the most rapidly growing large cities in South America (at an estimated 10.2 percent population growth per year). There, land with access to piped water, paved streets, flooding protection, and rudimentary wastewater removal, sells at 10-15 times the price of comparably located land without these services (Peterson 1987). Detailed land price studies in Cali, Colombia and Bangkok have also reported large price differentials.

In urban areas where there is inadequate infrastructure coverage, infrastructure investment becomes the principal dynamic of the land market. In these conditions, the extreme differences in land prices between areas with and without infrastructure access do not reflect the cost of bringing infrastructure to new areas, but rather the scarcity value associated with public infrastructure services. If the public sector were to accelerate its infrastructure investment program, it could fully recover the costs of development from landowners, while leaving owners with net benefits in the form of higher land prices. That is, market price signals make plain that it is economically efficient to expand infrastructure coverage, because the market's willingness to pay, as evidenced in land price differentials, exceeds the costs of infrastructure installation. Infrastructure expansion also has the important additional

advantage of helping to lower overall land prices throughout the urban region by augmenting the supply of developable land.

In urban areas marked by strong demand and inadequate infrastructure coverage, then, it should be possible to construct a self-financing infrastructure expansion policy, wherein landowners in the benefited area are charged for the cost of infrastructure network expansion. This policy creates no net cost burden for the public sector; landowners in the new service zones receive capital gains; and those seeking homes or developable lots throughout the urban area benefit from lower land prices.

Note that any policy of recovering investment costs through land values must be rendered consistent with the policy on user fees for service use. One comprehensive costs recovery policy would be to recover the costs of augmenting source supply or generating capacity from all consumers through consumption charges; to recover the costs of household connections through connection fees; and to recover the costs of main trunk lines

Table 2

Land Price Increases in Selected Cities

City	Time Period	Average Annual Gain, Real Terms
Seoul, Republic of Korea	1963-74	20.2%
New Delhi, India	1957-77	16.9
Bangkok, Thailand	1981-87	24.2
Caracas, Venezuela	1973-77	16.0
Kingston, Jamaica	1978-87	15.1
Manila, Philippines	1973-77	7.2

Source: Dowall (1989); Doebele (1988).

or main roads needed to open up new residential areas from benefited landowners. Where users must pay the full incremental costs of service supply in the rate structure, the increase in land value from connection to the urban network will be less, and the amount of revenues appropriately raised through land taxes also will be less. In the extreme case of local roads, there typically is no local service charge at all, while virtually all benefits redound to local users and owners. In this case, full cost recovery from landowners is appropriate. In other cases, cost recovery can be split between landowners and service users.

Note, too, that in the case where residential owners of property are to be connected to infrastructure systems, cost recovery based on land-value increases merges into cost recovery based on development charges. The latter recovers from individual homeowners the pro-rated cost of bringing services to a neighborhood. The former also recovers the cost of installation, but allocates the cost among beneficiaries according to land-price gains. In practice, the two systems are likely to lead to a similar set of charges. It is only when larger tracts of land are involved, or where land in commercial and industrial use is benefited, or when the infrastructure investment in question, like a road, benefits a population beyond that immediately connected to it, that the distinction between connection charges and charges based on land-price benefits becomes practically important. There may also be an important difference in the incidence of user fees and land charges if a large part of the population is renting, formally or informally, from landowners.

The proposition that landowners should surrender to the public part or all of the land-value gains created by public investment has appeal on equity and redistributive grounds, as well as efficiency grounds. At the 1976 Vancouver Conference of Habitat, participating nations passed a resolution calling for the recapture by public bodies of all the "unearned increment" in land values resulting from public investment. This is a far stronger position than the proposition that public bodies should recover the costs of investment from benefited landowners. However, cost recovery from land-value increments has been slow to be adopted in most countries.

BETTERMENT LEVIES

Betterment levies are charges imposed on landowners to specifically finance infrastructure development. They customarily are designed to cover the costs of public investment, but are allocated in proportion to the land-value increases (or benefits) owners are expected to enjoy as a result of the investment. For any investment projects that have been subjected to cost/benefit analysis, or have been voted on by beneficiaries taking into account the payment scheme, it can be assumed that benefits will exceed costs, leaving landowners with a private surplus, even after they pay their betterment levies.

Betterment levies have been used since Roman times and are fairly common in developed nations. In the developing world they are employed most extensively in Latin America, particularly Colombia (where the process is known as valorizacion) and Panama. At the

height of their usage, they financed 16 percent of all local public expenditures in Bogota. Although their share of spending has declined in recent years, valorizacion continues to be an important tool of infrastructure finance.

As implemented in Bogota (Doebele, Grimes, Linn 1979), valorization is administered primarily by the semi-autonomous Institute of Urban Development. The District Water and Sewer Authority and the national Ministry of Public Works also have authority to carry out valorization projects in the city. Main roads and sewer trunk lines are installed in accordance with master capital development plans, after evaluation of local costs and benefits. Neighborhood paving projects are initiated by local community boards.

For each project, a zone of influence is specified within which land values will be affected. The pattern of land value gains resulting from the project then is projected. Land value impacts almost always vary with distance from the improvement, and may vary as well with other factors, such as (in the case of a main road) the part of the city traversed, the suitability of land for residential or commercial use, or lot size and shape. From these calculations, an expected land-value appreciation is computed for each piece of property in the zone of influence. The valuation projections are a formal and well-defined exercise, requiring extensive analysis, review and approval. The process is designed as much to instill confidence that professional standards are being applied as to obtain greater exactitude in value estimates. At the end of the process, the cost of implementing the capital project is allocated among all affected property owners, in proportion to the projected benefits from the land-price increases.

Cost recovery from betterment taxes is most suitable for works that have localized externalities, such as roads and sewer systems. These facilities have a clear pattern of benefit beyond immediately connected properties, and therefore are not appropriate for cost recovery through user charges alone. Roads and sewers, in fact, have been the projects most frequently financed by valorizacion. The system at one point was transferred to Tegucigalpa, Honduras, to finance local water connections. However, it was found to be unnecessarily complicated. Since essentially all of the benefits of water usage are internalized, and in owner-occupied neighborhoods there is no distinction between the landowner and the user, the same results could be achieved more easily by charging each household a standard connection fee. The further step of calculating probable land-value changes and allocating costs in proportion to these only obscured the fundamental investment activity.

Implementation Problems

Three difficulties have stood out in implementing betterment levies. First, they require good cadastral records, which establish land ownership and the value and characteristics of all land parcels in the zone of influence. This generally means that it is practicable to administer betterment levies only in cities which have well-functioning property tax systems, or have assembled land ownership records for other purposes. Attempts to utilize betterment levies in Jakarta, for example, have suffered from inadequate records on land owners and land values (World Bank 1988). Second, collection often has been difficult. In Bogota cumulative arrears

in 1986 amounted to 16 percent of project costs for projects undertaken between 1968 and 1986, a poorer record than for arrearages in infrastructure service charges. The worst record of payment belonged to land owned by government agencies. Collection experience has improved since 1980 with the introduction of interest charges on late payments. It also has been found to be better when beneficiaries play a greater role in project design and when repayment periods are relatively short (Pineda 1988).

The third difficulty associated with betterment levies has concerned treatment of low-income areas. Owners there frequently have very little savings except for their land and house, and may be unable to pay their betterment assessments without selling their homes. This problem, which arises as well in the use of development or connection fees, has been addressed in various ways. Revolving funds may be established which allow beneficiaries to spread out payments over a period of time, typically three years. Cross-subsidization may be introduced into the capital financing scheme by requiring owners of more valuable properties to pay a greater share of expected benefits, while requiring owners of low-valued properties to pay less. As a general rule, however, betterment levies will create fewer distributional problems than development fees or charges, since wealthier owners will tend to have larger parcels and the parcels whose value gains most from the availability of infrastructure services. The value of land authorized for commercial and industrial development also is extremely sensitive to infrastructure provision. Betterment schemes succeed better in targeting payments than do uniform user charges.

LAND READJUSTMENT

Land readjustment is a process whereby local governments, designated public entities, or private groups can participate in the value-enhancing process of urbanization and share in the increase in land values such development brings. It may be thought of as an in-kind system of betterment levies, appropriate for land development on a large scale.

In its basic form, land readjustment has the following steps: A plan for development of raw land in an urban area ready for development, acceptable to both the regulating local government and the owners, is devised. The areas required for public use (streets, parks, schools, and so on) are set aside, leaving lots for private development. The cost of providing the infrastructure is then calculated, as is the probable market value of the improved land. Lots with probable market value equal to the cost of development are then ceded to the local government in return for carrying out the investment.

The advantage of the land readjustment process is that if it is carried out correctly, both landowners and local government gain. The city is able to create new urbanized area without net outlays. The private land owners receive back developed land in nearly the same location as their original holding, and although they may lose up to 60 percent of their original area, the increase in value brought about by the installation of services more than compensates for the loss by raising the unit value of the land. Because the system is based on the exchange of land

title, not purchase of land, infrastructure can be financed without large amounts of long-term capital. In situations where the land market is buoyant (a characteristic of peri-urban areas in many third world cities), the sale of plots handed over to the development authority can provide an effective means of generating surpluses. These surpluses can be used to establish a revolving fund to finance continuing land readjustment projects or to cross-subsidize low-income developments.

In practice, land readjustment can become very complex in its application. The maintenance of equity in distribution of benefits is important to the success of the system. Equity issues arise at three stages. Before the project, consideration must be taken of the current relative values of land; flat, fertile land has a higher value and is cheaper to develop than hilly or marshy land. During the project, some lots will be taken out of production sooner or made available for use before others; adjustments must be made for income foregone during development. Finally, when the project is complete, some lots will have higher unit values than others, owing to different designated land uses, proximity to facilities, or other locational factors; an equitable system will ensure certain owners do not receive windfall gains because of the development layout.

Land adjustment works best when there are large amounts of undeveloped land in the hands of relatively few owners. However, this emphasizes the importance of linking the financing scheme to sound development planning. The success of a project will depend upon picking the appropriate time for infrastructure installation, and on other measures to encourage development of the land. Public authorities sometimes have combined land adjustment with a vacant land tax to ensure that infrastructure facilities are used once they are installed at a new site.

Land Readjustment in Korea

Land readjustment was introduced in Korea by the Japanese and its use became widespread for the rebuilding of urban infrastructure after the Korean War. Land readjustment has been effective in large cities; 43 percent of Seoul's built-up area in 1985 had been created by land readjustment projects. The system has been less successful in smaller towns; slower growth there has led to premature installation of services in many cases.

One difficulty with land readjustment in Korea is that while roads, schools, main sewers, and fire and police protection are provided through land proceeds, water and electricity are paid for by individual plot owners. These services are only installed once sufficient demand is in place, but the lack of water and electricity makes potential buyers slow to purchase and build. A similar problem exists for the provision of public transit service. To counter this, cities have built concentrated subsidized housing in order to bring services to the area, making other plots more attractive to buyers.

The direct benefits of the program (apart from the increase in subsidized housing stock) have accrued mainly to landowners and informal real estate brokers. (These brokers buy land

at relatively low prices from the original owners who are ill-informed or dislike the risk involved in the development process; much of the increase in value then accrues to the brokers.) The serviced land produced is not of direct benefit to low-income households (except for subsidized housing produced by local government), since its cost tends to be relatively high. However, by bringing more land into the market, the system has helped to keep urban land prices and rents below levels that would have occurred without readjustment, and the process has relieved pressure on capital budgets.

III. BORROWING FOR INFRASTRUCTURAL INVESTMENT

Borrowing for infrastructural investment should not be viewed, economically, as a separate source of funding from user fees and charges, betterment taxes, or other of the cost recovery strategies discussed here. Rather, borrowing is a means of accumulating the financial capital required for investment. In principle, if not always in practice, loans must be repaid. Debt finance therefore has the effect of stretching out the capital costs of investment over the lifetime of the debt instrument. Debt repayment (i.e., amortization of capital costs plus interest) still must be made either from project revenues or from general government revenues.

Borrowing does have the ability to greatly accelerate the volume of infrastructure investment that can be undertaken in a given time period. In effect, project revenues and government resources devoted to infrastructure support can be used to service debt rather than finance direct capital investment, thereby leveraging current investment levels. Whether shifting part of the costs of today's investment to the future is equitable and efficient depends upon the urgency of today's investment needs, the efficiency with which larger sums of money can be spent, and the public sector's ability to translate borrowing into additional investment rather than merely substitute it for financing from current revenue. The wisdom of increased borrowing must also be assessed from the macroeconomic perspective. Borrowing for public capital investment in some circumstances may encourage inflation by adding to aggregate demand, crowd out productive investment in the private sector, or (in the case of foreign borrowing) exacerbate foreign exchange problems.

Nonetheless, it is clear that improvements in infrastructure coverage, on the scale and timetable called for in the Global Shelter Strategy, will require more lending as a critical element of infrastructure finance. Additions to the existing capital stock of this magnitude cannot be financed from current revenues alone.

There are many dimensions along which borrowing for infrastructure investment may be examined. Some of the most important concern:

--The source of funds. Are funds borrowed competitively from the domestic private market or from public sources; and, if the latter, are they borrowed at market rates or subsidized rates? Or are infrastructure funds borrowed from abroad?

--The borrower, interest rates and loan security. Is the final borrower the national government, an autonomous agency, or local government? Is the security for loan repayment the project revenues that are generated by investment, or general government revenues? Is there a subsidy (explicit or implicit) in the interest rate charged to borrowers?

--The intermediation process. How do funds get transferred from the source of lending to the borrower? How efficient are the intermediary institutions?

SOURCE OF FUNDS

There has developed a policy debate in some third-world countries, and in international donor agencies, that parallels the difference in approaches toward infrastructure lending in the United States and Europe. In the United States, local governments and infrastructure agencies borrow funds directly from the private market. Moreover, they do so at market rates, which reflect the market's perception of the risk involved in lending to individual borrowers. (This borrowing does benefit from the fact that interest payments are exempt from federal taxation, which results in lower interest costs for borrowers than if they were taxable). In most European countries and Japan, by contrast, localities borrow for infrastructure finance from special public funds, or from institutions that were created specifically to provide credit for infrastructure investment, usually at below-market rates. In France, such lending is conducted by the Municipal Development Fund of the Caisse des Depots et Consignations, financed by state-controlled savings, pensions, and insurance funds; in Germany, by the German Municipal Bank, which is required to make a specified part of its loans for local infrastructure financing at specified interest rates; in Japan, by the Finance Corporation of Local Public Enterprises; in Norway, by the Municipal Pension Fund; and so on.

The same two strains are reflected in efforts to organize borrowing--especially local borrowing--for infrastructure finance in developing countries. One approach is to try to secure better access for municipalities and infrastructure enterprises to private-market lending. The advantage of such an approach is that, if successful, it reinforces market efficiency in the allocation of capital. It is particularly suitable for income-generating projects, where operating institutions possess flexibility of rate-setting and where revenues can be pledged to debt repayment as a first legal priority. These provisions move debt repayment part of the way from a <u>political</u> decision to a question of economic capacity, which can be judged along lines similar to banks' traditional project appraisals for loan applications. The principal disadvantage to borrowing on the private market is that, given the private sector's skepticism regarding the creditworthiness of local government and infrastructure enterprises, for the foreseeable future it can raise only modest sums of capital, for which infrastructure institutions will have to pay competitive rates, often in an environment of high real interest rates. Moreover, this capital is likely to be allocated in such a way that only fiscally strong localities have access to it. Smaller communities and weaker infrastructure institutions either will not be able to borrow at all, or will be forced to pay a large premium to compensate for the greater risk involved. That infrastructure loans are inherently risky activities is evidenced by the spotty record of repayment, both by local governments and autonomous government enterprises. The most recent reminder of this risk was the bankruptcy of the city of Rio de Janeiro in the fall of 1988, which included default on more than $200 million of infrastructure loans.

The alternative approach relies on channeling "captive" funds to infrastructure institutions. From an investment standpoint, it has the advantage of being able to tap vastly larger financial resources, which can transform the scale of public sector investment, while accessing these funds at below-market rates. The avoidance of market limitations, however, also is the weakness of these schemes. They may divert such large volumes of capital into the mandated activities that they cause reverberations of misallocated capital throughout the economy. This is particularly true when captive sources of capital, like government social security funds and wage tax receipts, are channeled into housing mortgages and housing construction, as well as infrastructure finance, at far below market rates. For example, the Mass Housing Fund of Turkey uses government funds to provide fixed-rate mortgages at well below the inflation rate. As the only source of housing credit in the country, its subsidies have steered 45 percent of gross domestic investment into the housing sector. To the extent that such measures succeed in their objective of reallocating capital, they do so outside the market place, substituting shelter-sector investments with lower private returns for other forms of investment with higher returns. Only if the externalities associated with shelter spending are large enough to warrant the nonmarket allocation and subsidy will such an outcome be justified.

If investment goals for shelter-related infrastructure are to be met, most countries will need to establish or sustain special intermediary institutions that can use government funding to leverage lending for infrastructure investment. However, the subsidy element in such lending should be firmly established. Lending institutions should operate on a strict cost recovery basis, except for this subsidy.

External borrowing for infrastructure projects raises a special set of issues. Some capital-intensive projects, like dam construction or transmission lines and transformers, have a high import component. But it is unusual for the import share of shelter infrastructure financing to exceed 50 percent. Borrowing foreign currency to finance infrastructure investment then becomes a two-step process. Part of the foreign exchange is used for imports. That part of the foreign exchange that is not needed for project purposes passes to the central bank, where it is converted to domestic currency to finance the domestic component of the project. There should be assurance that there are uses outside the shelter sector for the remaining foreign exchange, which justify the interest costs. It generally will be preferable to borrow externally only the foreign currency needed for project investment, unless the terns of lending are so attractive that infrastructure loans become the best available means of acquiring foreign exchange. Otherwise, the domestic component of expenditures should be borrowed locally.

BORROWING BY LOCAL GOVERNMENTS

Relative to cities in the developed world, third-world cities make comparatively modest use of borrowing to finance infrastructure investment. A survey of 25 large developing-country cities (Linn) found that gross borrowing accounted for only 6 percent of revenue inflows. Municipalities in the United States, by contrast, borrow more than 20 percent of their

revenue inflows, even though they are growing much less rapidly and face less of an investment burden.

Borrowing has not been used more heavily in large part because of the perceived riskiness of lending to local governments. If municipalities are to play their part in the expansion of the infrastructure base, as called for in the Global Shelter Strategy, ways must be found to make them more creditworthy borrowers. This, in turn, implies identifying reliable revenue streams that can be earmarked for debt repayment.

One such revenue stream is the income produced by the capital projects that are financed. If capital projects are well selected, and if user or beneficiary charges are employed to pay for them, the revenues generated should suffice to amortize the debt incurred in their financing. In countries that make significant use of market borrowing, there customarily are guarantees that help protect the lender's interest in a project. For example, it is customary to require in the debt agreement that debt repayment has first call on project revenues, even before salary payments; that service fees automatically will be adjusted upward whenever revenue coverage of the amortization payment falls below a certain ratio; and that a reserve fund will be established so that payments can continue in the face of unforeseen contingencies. Similar provisions can help municipalities in developing countries gain access to commercial credit markets. In tapping private credit sources for investment funds, nothing works as well as a track record of good financial management and the demonstrated legal ability, plainly written into an institution's charter, to raise prices when necessary to meet debt repayment obligations.

Another type of revenue stream that can be used to provide security for local borrowing is transfers from central government. To constitute effective security, these have to be stable income sources to which local governments are entitled by fundamental law. The transfers may then be pledged to secure debt repayment as a first priority. For example, in Costa Rica local governments participate in a revenue sharing program with central government. If a particular local government falls into arrears in repayment of debt, its arrearage is automatically subtracted from its revenue entitlement and transferred to the municipal development bank. The State of New Jersey in the United States has developed a program whereby state aid funds can be used to pledge security for local municipal bonds issued by high-risk cities. In any year in which there is a repayment shortfall, the state will automatically withhold aid payments to the city and deposit the funds instead in a trust account for bond holders. This program has succeeded in opening up lending for communities that were shut off from it, and in lowering interest rates substantially for others that were perceived to involve high risks.

INSTITUTIONAL INTERMEDIARIES: MUNICIPAL DEVELOPMENT FUNDS

The lending vehicle that has proved most popular in developing countries is the Municipal Development Fund (MDF). We use this term generically to describe special funds established through public sector intervention to make loans to local governments or

government enterprises and help finance infrastructure investment. Lending may sometimes be supplemented by grants and technical assistance for capital projects. MDFs are operated out of many different institutional settings, including central government ministries, special development banks, or metropolitan development authorities. Whatever the institutional arrangement, they obtain capital from government or from private sources with government assistance, then relend it to local authorities for infrastructure projects. Table 3 summarizes for selected countries the institutional aspects of MDFs.

MDFs have drawn principally on public funds for their financing. If private savings are tapped, this is done indirectly through loans from central banks or state-regulated pension or insurance schemes, typically at below-market rates. Funding from international donors has also helped to establish many loan funds for local governments. Once the fund is capitalized, further resources can be generated through the spreads charged on lending to municipalities. Opportunities for augmenting the original capital base in this way are especially great when the initial capital is provided by grant. In Jordan, 58 percent of new lending by the municipal development bank has been financed through internally produced funds; for similar agencies in Mexico and Colombia, the rates are 50 percent and 44 percent, respectively (Davey 1988). Capital can also be augmented by a steady flow of earmarked government resources.

Generally, all municipalities are eligible to borrow from the fund, although various allocative formulae (across locations, city sizes, and sectors) are employed. One of the most common tensions involves the lending standards of the MDFs. On the one hand, the municipalities that most need a special lending institution, because they do not have access to ordinary credit markets, are likely to be small cities with precarious finances. On the other hand, these municipalities also present the highest default risk to the MDF. Some MDFs have resolved this tension by lending to all municipal borrowers at the same rate. Others explicitly subsidize lending to municipalities with the least capacity to pay. Still others adjust interest rates in line with perceived project and municipal risk. San Pedro Sula, Honduras, for example, refused to participate further in the national MDF until the Board changed its policy and differentiated interest rates so as to reflect municipalities' past repayment records.

A second major aspect of MDF lending to local government has been the use of loan funds as a lever for improving municipal investment administration and infrastructure operation. Many lenders set project specifications, in terms of simplicity of design and operation, economic return, and equity considerations, or offer technical assistance to induce municipalities to undertake certain forms of investment. In this respect, they parallel at the local level the operation of international and regional development banks. Many agencies, such as those in Brazil, India, and the Philippines, go beyond project-specific requirements and will only agree to finance projects set within the framework of a medium term investment plan. If lending is to be secured by general government revenues, the MDF often will require an upgrading of the local tax base and tax collection system as a condition of the loan.

Undoubtedly, however, the most critical issue surrounding MDFs is their subsidy policy. Almost all MDFs have a subsidy element, even if it only extends as far as technical assistance.

Many target their subsidies in the form of grants that accompany market-rate loans in a joint financing strategy. The ratio of grants-to-loans may vary with local economic condition, or with the type of project funded. The Calcutta Metropolitan Development Authority, for example, provides the highest grant share for local slum upgrading projects. The greatest difficulties arise when subsidies are delivered in uncontrolled ways--for example, by lending for all uses at a low fixed interest rate in an inflationary environment or by failing to collect loan repayments. These measures swiftly decapitalize the intermediary. At the same time they allocate below-market capital in a way unrelated to any planned subsidy program.

Jordan: Cities and Villages Development Bank (CVDB)

The municipal credit system in Jordan was transformed from a central government function to an independent agency, the CVDB, in 1979. It provides both financial and technical assistance to municipal and village councils to promote wider access to infrastructure and employment. The bank acts as a pass-through agent for municipal shares of specific national taxes and a property tax collected by the national government on behalf of local governments. Municipal debt service is automatically deducted by the CVDB from these transfers. In the period 1979-1988 lending totaled over US$200 million. Internally generated revenues and equity (subscribed by the central government, the central bank, and local governments) accounted for 40 percent of total bank funding in 1985.

The CVDB has played a major role in the spread of urban physical (roads, water, electricity) and social (schools, clinics) infrastructure to virtually all settlements, even small and remote villages, despite a rapid national rate of urbanization. The Bank has helped establish high standards for investment projects. It has also been very responsive to client municipalities in developing investment planning and appraisal criteria and providing general budgeting and finance advice.

One of the major innovations of the CVDB has been its move away from standard debt-revenue measures in judging local borrowing capacity. It has found that these over-estimate the debt capacity of small municipalities and under-estimate that of larger municipalities. Its new criteria focus on current liquidity and projected future current revenue surpluses of local governments. This change uncovered unsustainable borrowing patterns in some municipalities and brought about changes in the allocation of bank lending.

IV. GENERAL FINANCING OF LOCAL GOVERNMENT

To this point, we have discussed revenue instruments designed specifically to help finance capital investment. Although more of the burden of capital spending can and should be shifted to these revenue mechanisms, part of capital finance--both at the local and central level--will continue to come from the general government budget. We therefore turn to a consideration of general revenue sources for local government, and of the methods of grant transfer between central government and local government. We give particular attention to the implications that changes in government revenue mixes have for capital finance.

DECENTRALIZATION: THE IMPLICATIONS FOR INFRASTRUCTURE FINANCE

Partly in view of the fiscal constraints central governments face, but also because of frustrations with central governments' ability to deliver efficiently the local public services that citizens want, a movement toward decentralization has been gathering speed in developing countries. Decentralization has become a keystone to development strategy in several unitary nations like Indonesia, Tunisia, and the Ivory Coast, as well as in formally federal nations like Brazil, Mexico, and India, and even in small countries like Honduras, or countries with rudimentary administrative systems like Zaire. The commitment to "decentralization" does not imply a single agenda. In some countries it takes the form of devolving central-agency administrative authority to the local level; in others, it involves strengthening the independent authority of local government, under elected mayors, while endowing local government with greater public service responsibilities. In virtually all of its manifestations, however, it implies greater budget resources and greater budget discretion at the local level.

Decentralization appears to represent an important shift in the thinking of developing countries, even though the rhetoric and ideology surrounding it can exaggerate the practical changes that are made. The specific implications for infrastructure finance of transferring revenues and service responsibilities from the central government to the local level are far from self-evident, however. The mere transfer of revenues from one level of government to another does not augment the total resources available for a particular function like infrastructure investment. Even less can a shifting of expenditure responsibilities alone be counted on to generate net revenue gains for a budget function.

The expectation that decentralization can help close the infrastructure financing gap is founded on two arguments:

First, community infrastructure investment appears to be a more critical budget priority to local government than it is to central government. Tangible "works" that support shelter development and economic activity are viewed by citizens of developing countries as the

primary output of local government. If this is true, the transfer of general revenues from central to local government can be expected to generate more infrastructure spending as local priorities are substituted for centrally determined priorities. Moreover, public reaction against inadequate infrastructure investment often underlies the pressure for decentralization. Therefore, it is common for decentralization to be accompanied by measures that not only enhance local revenues but specifically earmark these revenues for infrastructure spending, or at the same time establish new institutions to handle infrastructure financing and investment.

Second, it is often held that infrastructure projects can be selected, designed, implemented, and operated more efficiently at the local level. That is, local governments can get more "bang for the buck" than central government from a given level of infrastructure investment. They have the ability to be more responsive to the local citizen in establishing investment priorities and, if financial incentives are set correctly, have a greater interest in seeing that local projects are built and operated efficiently.

The validity of both these propositions, of course, is an empirical matter; it is not expected that they will be universally true. In particular, local government revenue sources may be so constrained by central government that unless the constraints are relaxed as part of the decentralization effort local governments cannot generate the wherewithal to increase investment spending, even when they desire to do so. Moreover, where adequate revenue growth is available to local governments, they may lack the administrative and analytic capacity to select and implement many more projects than they presently are carrying out.

Colombia's Decentralization and Municipal Strengthening Program

The linkage between decentralization, municipal strengthening, and infrastructure finance is best exemplified by the fundamental reforms recently enacted in Colombia (Calderon 1988; Bird 1987).

These reforms have both political and fiscal elements. Politically, the most important change is the establishment of locally elected mayors. Fiscally, the revenue base of local governments has been strengthened both in terms of their ability to raise revenues on their own and their sharing in centrally collected revenues. The value of local property tax bases was updated to compensate for past inflation, and provision made for future automatic adjustments to reflect price index changes. Although political resistance has kept the full goals of this reform from being met, the erosion of local property tax bases has been slowed to an important degree. For the first time, local governments were given discretion in setting property tax rates between limits of 4 and 12 mills. Fiscal decentralization was completed by raising the share of national sales tax receipts allocated to the local level from 30 percent in 1986 to 50 percent in 1992. The additional resources are being channeled principally to cities under 100,000 population and are to be accompanied (by 1992) by a transfer of central-government service responsibilities comparable in budget amount to the revenues transferred.

From the beginning, the desire for more local infrastructure investment was a large part of the motivation for fiscal reform in Colombia. Centralization had become so extreme that local authorities had to go to the capital, Bogota, to plead to national officials for funds and approvals for virtually every investment, from minor road repairs to school construction. All public investment in effect rested on the borrowing capacity of the central government, which was overwhelmed.

Against this background, the law augmenting revenue sharing transfers to local government also required that all incremental revenues resulting from sales tax allocations had to be devoted exclusively to investment (including maintenance and amortization of debt). The additional transfers are projected to reach US$75 million in 1988, rising to US$950 million annually by 1992. Importantly, Colombia's financial institutions have adjusted their lending procedures to leverage this future stream of revenues into immediate investment. The Financial Fund for Urban Development (FFDU) of the Central Mortgage Bank in the preceding ten years served as intermediary for 200 municipal infrastructure loans for a total value of US$300 million, but it has scaled upward its operations and in the first six months of 1988 it received applications from 600 municipalities for more than $333 million in loans. (The Financial Fund for Urban Development is a variant of the MDFs discussed in the preceding section. It operates in the secondary market, by purchasing a share of the loans made to local governments by primary lending institutions. Primary lenders, however, typically require that the FFDU will participate in a project, before making a local loan commitment.)

The first priority in funding is the upgrading of potable water and basic sanitation coverage. It is estimated that it will cost the country US$820 million to increase potable drinking water coverage from 78 percent to 85 percent in urban areas and from 25 percent to 30 percent in rural areas, goals that are well within financial reach by 1992 given the new investment resources.

Although Colombia, of course, is unique in the specifics of its decentralization program, the fundamental linkage between decentralization and greater resources for infrastructure finance is shared with most other countries that have launched such reforms. In Indonesia, a program to strengthen the municipal role has been coupled with the launching of a municipal development fund to finance higher levels of local investment. In Mexico, one of the key actions has been to invigorate BANOBRAS, the municipal development fund, and infuse it with new capital for on-lending to local authorities for infrastructure investment. In Guatemala, a new provision of the constitution requires that the central government automatically allocate 8 percent of its total receipts to municipalities for infrastructure investment and investment in income-generating public services; the priorities for local investment are to be selected by local community development councils. In Bolivia, when fiscal reform gave more revenue to the mayors of the largest cities (newly elected under a parallel political reform), the two largest cities, La Paz and Santa Cruz, devoted 80 percent of the revenue increase to local capital investment.

Indeed, in some case of revenue sharing with local governments, the operative constraint on infrastructure spending no longer is revenue availability but the ability to design and execute projects, or to operate them on an efficient cost-recovery basis once they are constructed. The Colombia reforms, for example, will increase by more than tenfold the resources available for investment by smaller cities, but few of them now have the capacity to ensure that resources of this magnitude are translated into economically and socially sound projects at the local level. Strategies for enhancing local planning capacity and capacity for contract management will have to accompany fiscal reform, if the new resources are to be wisely put to work.

THE LOCAL REVENUE BASE

A long-term commitment of local governments to adequate infrastructure investment will require that they have adequate general local resources to draw on. Almost all revenue sources are fungible to an important degree, regardless of nominal earmarking for specific uses. If local budgets come under severe aggregate revenue limitations, infrastructure spending will suffer, just as it has at the central level in times of a budget squeeze. Thus the entire local revenue picture is of interest to infrastructure financing.

Criteria for Evaluating the Local Revenue Mix

The revenue structure of local governments should be guided by several criteria:

Revenue Yield and Revenue Growth. Local governments have an obvious interest in a revenue base that can yield adequate income today, and will grow over time in line with inflation and economic activity. An income-elastic tax base will avoid the need for the constant introduction of new taxes, or persistent increases in tax rates, in order to maintain real revenues.

Economic Efficiency. Local taxes should interfere as little as possible with the efficient functioning of national economic markets. At the same time, wisely selected taxes can reinforce the efficiency of local land and development markets, and support collective choice in setting levels of local public service provision.

Distributive Effects. The local tax system should not impose burdens on the very poor. Beyond that, fiscal policy to affect income distribution should be primarily the responsibility of national government. Wealthy taxpayers and businesses always have the option to move to another location, if one local government tries aggressively to redistribute income. For this reason, beyond sparing the very poor, the local tax structure should probably be as neutral as possible over the income distribution, except for taxes imposed uniformly on all localities by the national government.

Administrative Simplicity. No tax is a good tax unless it can be administered efficiently. In developing countries, the ability to levy taxes, collect revenues, deal with tax complaints, and monitor revenues often is sharply circumscribed. This places added weight on administrative simplicity, and on revenue sources that can be largely self-administered through markets.

Alternative Revenue Sources

How do various tax and revenue sources rank under the above criteria?

Property and Land Taxes. A local property tax compares favorably under three of the four standards for evaluation. Urban property wealth, when assessed at market value, provides an abundant base for taxation in almost all developing-country cities that are large or growing. As was demonstrated in Table 1, land values not only have stood up to inflation, but typically have advanced in excess of the rate of inflation plus real economic growth. In cities that are growing, new improvements, both in the residential and commercial-industrial sectors, also are added at a rapid rate, and existing improvements are constantly revalued under the pressure of demand and inflation. The fear sometimes expressed in developed nations that the property tax will not provide a buoyant revenue base, therefore, is unjustified in developing-country cities, as long as there is a means of adjusting valuations for tax purposes.

The property tax potentially is a good tax for supporting market efficiency. It is one of the few taxes that can be used effectively for adjusting local budget levels in line with citizen preferences. The property tax rate can be adjusted upward or downward by a few mills when citizens want to provide more local services, or want to undertake debt financing of infrastructure investment to be repaid through general revenues. Adjustments to other revenue sources, like business franchise fees, are more difficult to make and more difficult to reverse. Of course, effective use of the property tax to support local collective choice requires that local authorities have the power to adjust local tax rates, at least within some range. This is still relatively rare. It also requires local voting on service level preferences, either directly or indirectly through political candidates that stand for different local spending programs.

The land component of the urban property tax supports land development markets. Most cities in the developing world are burdened with large amounts of vacant land within their developed boundaries. These plots are being held by investors (or speculators) who have found urban land to be a good investment vehicle. However, their holdings help add to the costs of the infrastructure budget, for the development diverted from already serviced zones must jump to the urban fringe, where it ultimately makes necessary greater public expense in infrastructure service provision. Vacant land holdings are reported to constitute 72 percent of all parcels in Buenos Aires, 64 percent of all land in Metro Manila, the Philippines in 1973, and 75 and 50 percent of New Maadi and Nasr City (both in Greater Cairo, Egypt) in 1977 (Doebele 1987). Land taxation is able to add some fiscal pressure to develop these vacant parcels. In effect, it places a public charge on the land, which corresponds to the public cost

inflicted by keeping a parcel off the development market. If further fiscal pressure is justified, a special vacant land tax may be enacted, using the property tax system.

The property tax, if imposed on market values, qualifies as a progressive tax in urban settings of the developing world. Various studies have found residential property values to be highly correlated with household income and total household wealth.

The property tax may be faulted for its administrative complexities. Its application requires a good cadastral mapping system, complete with information about the characteristics of all developed and undeveloped parcels, and a tracking system for monitoring new construction. These systems have proved difficult to put in place and keep in operation, though where there has been success, the information collected has proved invaluable for all types of local economic planning.

Most of all, the property tax's equity and economic efficiency depend upon keeping assessed values for tax purposes consistent with the market values of property. When the assessment system breaks down, the property tax tends to become a regressive tax, as well as one that lags badly behind inflation. This often is treated as if it were an administrative problem. However, successful administrative reforms have demonstrated that it is technically feasible to reassess properties regularly (Dillinger 1987), and to adjust property values automatically for inflation between reassessments. The resistance to these steps is political, and indicates that the property tax can be too successful in placing its burdens on wealthy property owners.

Automobile and Truck Fees. As indicated in the discussion of user charges, automobile and truck registration fees are an appropriate part of an efficient user-fee structure. However, these items may be tapped as pure revenue sources, as well. They are easily located and easily taxed, since registrations are needed for operation. In developing countries, vehicle ownership is closely related to household income levels, making registration fees moderately progressive. From the point of view of economic efficiency, any pure tax burden should be placed on final consumers (i.e. household vehicle registrations) rather than on business use of vehicles, since the latter will open inefficient wedges in the tax burden on different types of goods, depending upon their transportation characteristics. (Newbery and Stern 1987).

Sales Taxes. A broad-based sales tax falling on final consumers, or a value-added tax falling equally on value added at all stages of production, also meets most of our tax criteria. It avoids the inefficiencies of high rates of taxation on narrower bases. It can be administered straightforwardly as an adjunct to private market transactions. Since it is placed on the value of virtually all domestic output and imports, tax revenues grow in line with inflation and economic activity, and it is approximately neutral with respect to household income levels. This type of tax should be imposed uniformly on economic activity and sales, regardless of geographic location. It therefore is inappropriate for local rate-setting, but fully appropriate as a base for national revenue sharing with localities.

Octroi and Local Taxes on Natural Resources. Two taxes that fail to meet the evaluative criteria are the octroi and local taxes on natural resources or their extraction. Both of these taxes try to shift the burden of taxation from the local community to outsiders, and in the process introduce inefficiencies into the national economic system. The octroi is a type of sales tax that taxes goods from outside the local area as they enter it through a highway, rail or waterway entry point. It inefficiently protects local production against outside competition from other regions of the country. In the process it distorts internal trade, and sets up perverse incentives for producers to move from where production is cheapest to where markets are biggest, in order to avoid the local import duty. This not only leads to inefficient location decisions, but tends to exacerbate growth in the biggest markets, where there are already likely to be negative externalities associated with growth.

A local tax on natural resources exports the tax burden to the rest of the country, if there is domestic consumption of the goods made from these resources. If the natural resources or their products are exported to foreign markets, the local government, by imposing its tax, pre-empts tax revenue that could otherwise be enjoyed by the national government, and may interfere with export markets and national growth in the process. In either case, local government tries to take advantage of its monopoly location with respect to the resource base to extract payments from the rest of the nation. For this reason, most governments prohibit local taxation of important resources, although there are a number of such arrangements that have survived.

GRANTS AND TRANSFERS

Local governments also obtain revenue through grants and transfers from higher-level governments. The purposes and forms of these grant mechanisms are diverse, but the objectives may be summarized for analytical purposes under four headings.

Fiscal Equalization

The tax base capacity of local governments varies widely, according to city size, regional location, and other factors. One function of central-level fiscal assistance is to narrow these inequalities by providing local governments access to nationally raised tax revenues.

Aid for the purpose of fiscal equalization is best implemented through some type of revenue-sharing program, in which local governments automatically participate in a share of national tax receipts. The value-added tax, or another broad-based tax that grows with inflation and economic activity, provides the most suitable basis for revenue sharing.

Some countries have incorporated strongly redistributive allocation formulas into their revenue-sharing programs. In Colombia and Brazil, for example, smaller cities receive much higher per capita contributions than do large cities. In other countries, all of the cities in a poor region or in a region designated for development emphasis may receive larger per capita

payments; or local per capita incomes may be built explicitly into the distribution formula, so that revenue-sharing receipts vary inversely with local income levels. All of these formulas sharpen the redistributive impact of revenue sharing. However, it should be kept in mind that even the simplest revenue-sharing formula, based on uniform per capita allocations, is highly redistributive compared to local reliance on own sources of revenue.

The formula for local revenue-sharing in Bolivia's new value-added tax illustrates how the choice of formula can defeat fiscal equalization. Bolivia's tax receipts are shared with local governments in proportion to local collections of value-added tax payments. This procedure not only preserves differences in levels of local economic activity, but exacerbates them. Industrial firms with factories in different locations, for example, pay their value added taxes at their headquarters locations in La Paz, while the import component of the tax is collected at a few entry points. When revenues are returned to localities, based upon the point of collection, the allocations are even more highly skewed than are underlying levels of economic activity.

Expenditure Stimulus

Grants-in-aid frequently have the purpose of stimulating certain kinds of expenditures at the local level. A matching grant that pays a proportion of local costs for designated expenditure items has the effect of lowering the net cost to local authorities, thereby encouraging expenditures of this kind. In principle, matching grants are appropriate for services that have positive externalities that extend beyond the taxing jurisdiction. The central government matching share should coincide with the externality share in service provision. By compensating local government for the service's externalities, the national government can induce the optimal amount of service provision, overcoming the locality's tendency to under-produce the service.

Although formerly common in developed countries, matching grants never have been widely used in most developing nations. They are now finding application in infrastructure finance, however. The Calcutta Metropolitan Development Authority, for example, provides local jurisdictions with a mix of loan and grant funding, with the grant proportion varying by expenditure purpose. The grant share is one-third for drains, parks, and roads; 100 percent for slum improvement; and 0 for markets and water supplies. The matching share thus varies broadly with the magnitude of external benefits or social redistribution involved.

Performance Grants

The same principle involved in matching grants can be used to stimulate local governments to reach other goals. If grant payments are made contingent upon achievement of an administrative or budgetary goal, the grant will serve as a fiscal inducement to performance. The Calcutta Metropolitan Development Authority recently adopted an interesting set of performance grants. They link the size of capital grants to local governments' progress in closing their operating budget deficits. Performance grants can also

be linked to meeting milestones in infrastructure provision--e.g., to reaching planned goals for sewer or water coverage--or be linked to meeting minimum standards of system performance, such as a maximum allowable rate of water loss from the water distribution system.

Deficit Filling Grants

Probably the most common form of grant assistance in developing countries is an ad hoc payment to help localities cover a budget deficit they have incurred. These may be thought of as perverse performance grants. In effect, they reward localities for poor fiscal performance, by providing external assistance if and only if localities run deficits. Such payments have contributed mightily to the erosion of local fiscal discipline and on occasion have prompted a dangerous gamesmanship, wherein local governments deliberately spend excess amounts in the hope that this will force greater assistance from central government in the form of deficit bailouts.

PART 3

SPECIAL ISSUES IN INFRASTRUCTURE FINANCE: THE PRIVATE SECTOR ROLE AND PROTECTION OF THE POOR

I. THE PRIVATE SECTOR ROLE IN INFRASTRUCTURE PROVISION

The private sector already plays a large, if often unacknowledged, role in the provision of shelter-related infrastructure. Most attention has been devoted to public-sector contracting with private infrastructure suppliers, or to formal "privatization"--i.e., the sale or transfer of public sector enterprises to private owners. However, this emphasis obscures the many other ways that the public and private sectors can work together in productive partnership to meet infrastructure needs.

At the upper end of the income scale, residential developers for the formal sector often are required by national development standards to install at their own expense internal roads, water distribution lines, and local sewage removal facilities. The cost of this on-site infrastructure is capitalized into the price of land and housing and paid for by the home purchaser. In this way, it relieves public sector budgets of the need to finance capital investment.

At the other end of the income distribution, public authorities often do not provide infrastructure services at all to the poorest of urban neighborhoods. These areas then are forced to rely on private suppliers of substitute services. More often than not such suppliers operate "informally"--that is, without public licensing, and without complying with publicly promulgated standards. In fact, in many countries public authorities have tried to shut down private operators of this type, even when service coverage by public entities is inadequate or nonexistent. Prudent public policy should instead look for ways to expand private-sector activity, while enforcing those minimal standards of health and safety that are truly necessary. This will generate greater access to infrastructure services without draining public resources.

The possibilities for public-private partnership extend beyond the installation of capital facilities or the provision of infrastructure services by profit-seeking firms. At the neighborhood or community scale, collective decisions about infrastructure provision and financing often can be made outside of government. Neighborhood associations, for example, may act in lieu of government by taking on collective responsibilities and raising funds from their individual members. These groups normally will require at least de facto recognition from government, but they form part of a large, nonprofit private sector.

CONDITIONS FOR PRIVATE-SECTOR EFFICIENCY

Competition

The private-sector model of for-profit service provision is built on the premise that competition among rival firms produces accountability to the consumer, in terms of the type of product delivered and prices charged, and forces efficiency in production upon those firms that

survive in the marketplace. The scope for private-sector for-profit activity therefore is greatest when the scale and character of service delivery permits competition. These conditions are best met when services can be efficiently provided by relatively small firms, without large amounts of capital investment, employing a low-skilled work force. Entry into a service function then is open to a large number of actual or potential competitors.

As the scale of efficient operations and initial capital requirements mount, the scope for competition diminishes. The barriers to entry mean that, especially in poor countries, a few oligopolistic firms are likely to divide up a market. The problems created are especially acute when these firms can collude with one another, as will be the case when government is unable or unwilling to enforce competition.

Special public action then will be required to substitute for market competition. One possibility, even in an industry that constitutes a natural monopoly, is for the public sector to carry out the basic capital investment and retain asset ownership, then hold competitive bidding for the franchise rights to operate the infrastructure network for a limited period of time. The contestability of the franchise can achieve the same efficiency benefits as competition in production. However, if the entire burden of infrastructure financing is left in the hands of government, this option fails to relieve public investment budgets. To transfer the task of capital accumulation to the private sector, without incurring the risks of monopoly exploitation, the best strategy is to hold competitive bidding for the entire package of construction and operation of an infrastructure facility, subject to previously stipulated pricing regulations. China recently has awarded foreign firms the rights to build and operate complex systems at their own expense, thus passing on the risk as well as capital financing obligations to private operators. Although to date this strategy has been used principally for industrial investments, like steel or cement plants, it could in principle be used to finance infrastructure systems, as long as investors can be assured of a positive rate-setting environment. In fact, Turkey built its new toll bridge over the Bosporus through this type of arrangement with the private sector, and Argentina has entered into an agreement with Telefonica of Spain for the latter to modernize and expand telephone coverage, while operating the telephone system in partnership with national public enterprise.

Service Standards

For-profit firms providing infrastructure services often will be tempted to ignore desirable service standards, as this is an easy way to cut production costs. In a truly competitive market, competition would squeeze out firms that fail to produce to the quality consumers want and are willing to pay for. However, in practice the competitive paradigm may fail for various reasons. Even where there is nominal competition, consumers may not possess the information that allows them to distinguish between quality levels. For example, in Central America and South America private vendors of water often sell unhealthful water, sometimes taking it from open streams that run through the city rather than from safe water supplies. Neighborhood consumers have no way of determining the safety of the water they purchase, and in any event have no alternative source of supply to turn to.

There is a difficult balance to strike in establishing public control over standards of infrastructure service. On the one hand, public authorities have the responsibility to protect public health and safety. This may require licensing and regulation or private suppliers to ensure that they meet public standards. Retail water vendors, for example, may be required to demonstrate that they have purchased water at public supply points, where the water has been certified as safe to drink. On the other hand, much of the informal-sector activity in infrastructure services has sprung up precisely because the public sector has established unrealistic service norms, which consumers do not want to meet, given the extra costs they impose. These informal operators serve not just neighborhoods neglected by public agencies, but also serve, at lower standards and lower costs, households who cannot afford to buy the services provided by public authorities or by licensed, formal private-sector suppliers. The only reasonable answer to this predicament is for the public sector to prescribe the absolute minimum standards necessary for the protection of health and safety, while allowing the market to sort out the demand for optional characteristics of service provision.

PUBLIC-PRIVATE PARTNERSHIP IN SERVICE PROVISION

The possibilities for public-private collaboration in infrastructure service provision are best illustrated by the transit and water-supply sectors.

Transit

Privately operated public transport systems exist in virtually every developing country, whether legal or not. The public sector may have established itself as a monopolist supplier, or have licensed a single private supplier, but a monopolist's service and routing can rarely match demand. Informal private sector operators then spring up to fill the gaps in demand. The transit market meets virtually all the requirements for successful competition: the capital requirements for entry are modest (no more than a single vehicle of any type); few special skills are required; and for the types of services provided, there are few economies to scale.

The relative characteristics of public and private transit systems have been examined in a number of developing country cities, including Abidjan, Bangkok, Buenos Aires, Cairo, Calcutta, and Kuala Lampur (Roth 1985; Hanke 1985; Walters 1979). Public operators and monopoly-franchise private operators tend to operate considerably larger buses, and concentrate services on main commuting routes. Private operators use smaller vehicles, provide service along smaller roads where there is less concentrated demand, and reach into the poorest communities. Public operators almost always are subsidized; private operators generally are not. Where their routes overlap, public transit provision tends to be cheaper (because of the subsidy), but also marked by much longer waiting times.

As these characteristics suggest, most publicly owned transit systems are able to work out at least a de facto accommodation with private operators, where the market is divided between

the two. An example of this accommodation can be found in Abidjan, the Ivory Coast. In 1960, a French firm was awarded a 15-year contract to provide urban transport services for the city. The resulting monopoly, SOTRA (Societe des Transports Abidjanais), has relied on an assortment of vehicle sizes and developed a wide network of routes. Despite SOTRA's efficiency and legal monopoly, the Gbakas, small trucks operated by the private sector, are a large and growing service that currently carries approximately half of all rush-hour passengers in outlying areas. The Gbakas are more flexible, have longer operating hours, and penetrate more deeply into poor areas. They effectively complement SOTRA's service, though they were formally outlawed in 1974 as constituting "unfair competition" to the private franchisee.

De facto public-private partnerships that operate outside the margin of the law, or without appropriate public regulation, do pose problems of service provision, however. In Nairobi, Lima, Guatemala City and other places very high accident rates have been reported among informal-sector carriers. The accident record is exacerbated by the fact that unregulated vehicle operators rarely have insurance. Poor maintenance of informal-sector vehicles have contributed to breakdowns which impede traffic, and have become a source of constant complaint in some African cities. The lack of a reasonable regulatory regime also can lead to overall instability in transit provision. For example, in Lima there have been successive waves of new, informal and illegal entrants into transit supply, with their replacement of an older generation often marked by mass strikes, violence, and political antagonisms (DeSoto 1987).

In contrast with the chaos that can result from de facto sharing of responsibilities, there are encouraging examples in the developing world of deliberate partnerships in transit service between the public and private sectors. These formally acknowledge the right of private suppliers to provide transit service, but impose some regulations, including the requirement that drivers be licensed, that vehicles are insured, and that operators follow a fixed and posted route. Where public-sector regulation often has failed is in trying to impose excessively severe rate limitations. If operators are prohibited from earning a positive return on their service, they will be forced into abandonment of their routes or into taking shortcuts (like lack of maintenance) that are not in the public interest. Given the ease of entry into transit, the most effective means of restraining prices is by taking advantage of the potential for competition. One example of a deliberate public-private partnership of this kind is found in Colombo, Sri Lanka, where the transit system was revamped in the late 1970s to permit a growing private sector, with government regulation of routes, safety, insurance, and vehicle inspection. Transit subsidies were reduced, and service improved.

Regulation does not have to be performed by the public sector. Oversight can be shared with associations of operators. In the Philippines, for example, "jeepneys" provide public transportation under government regulation, supplemented by association oversight. Under a system pioneered in Longap City, a city of 220,000, route associations for particular areas have assumed much of the responsibility for monitoring carrier eligibility (based on possession of a driver's license, a safe vehicle, and required insurance), preventing entry of uncertified vehicles, and preventing fare gouging (Pak Poy and Kneebone 1984). Regulatory responsibilities cannot be turned over entirely to the private sector, however, since cooperative

associations can easily take on the characteristics of monopolists, working more to restrict entry than to protect service quality.

Water Supply

Experience in the water-supply sector has been similar to that in transit. In most developing country cities, the public water system has significant gaps in coverage, especially in areas where the poor live. These gaps have been filled by private suppliers, sometimes in explicit cooperation with the public sector, more often in de facto arrangements that have improved overall service supply but have also created special problems.

Water supply in Abidjan illustrates the type of de facto accommodation that is reached (Dei 1985). A private franchisee, SODECI (Societe de Distribution d'Eau de la Cote d'Ivoire), enjoys a monopoly right of water distribution. Despite an impressive record of operation, its coverage has not kept up fully with Abidjan's population growth. In response, private water vendors have proliferated. They obtain water at public fountains, from private connections to the SODECI system, or often from illegal taps into the system that circumvent payment. They then sell the water in unserviced areas at high profits. SODECI has responded to this situation with plans to install additional fountains to capture more of this profitable segment of the water market, at a lower consumption price than is now being charged by the unregulated suppliers. Although unwelcome to SODECI, competition is helping to produce service improvements.

Experience in Tegucigalpa, Honduras demonstrates some of the risk involved in de facto sharing of service responsibilities with the private sector. Vendors from tanker trucks have a very poor record of protecting water quality, and sell water at 15 to 20 times the per unit cost of water from the public system. This situation has persisted in large part because entry into the water-vending market requires a large capital investment to purchase sophisticated tanker trucks that can traverse the steep hillsides where the unserviced neighborhoods are. Moreover, public water supply in poor areas is extremely inadequate, making it impossible for residents to collect water even from distant standpipes. With no effective competition in service supply, and with difficult entry into the field, the conditions for extreme markups in pricing and lack of quality control are met. The government is responding to this situation with a proposal to require licensing of private vendors, so that water is obtained only from healthful supplies. There are also proposals to establish price ceilings. It is recognized, however, that over the foreseeable future the public sector will be unable to provide universal coverage, and that the private vendors perform an essential complementary service. Any price regulation, to be successful, will have to permit a broad markup in the price of water to cover the very substantial costs of capital equipment ($100,000 per tanker truck) and operations.

DEVELOPER INSTALLATION OF INFRASTRUCTURE

In developed nations, it is customary for developers to install on their own the on-site and neighborhood infrastructure necessary to support their developments, or to bear the full costs of public installation of these facilities. Such infrastructure includes local roads, water and sewer lines, lighting, electricity distribution, etc., as well as the major extensions of trunk roads and trunk water lines that are needed to service the development. These investments may easily account for 25 percent of the total cost of a middle-class house, or well over half of the final cost of a serviced lot in a sites and services project.

Over the last decade in the United States, even more of the costs of public infrastructure investment have been shifted to developers and new homebuyers. In fast-growing states it is now common for public authorities to demand from developers contributions of land or money that cover the indirect capital costs imposed by new development. That is, developers are required to pay the costs of school buildings, health clinics, parks, and expansions of existing main roads that are made necessary by population growth. This shift of capital financing responsibilities began in earnest after Proposition 13 in California and similar tax and borrowing limitations in other states made it impossible for local governments to continue to issue bonds to pay for these public capital facilities.

Some developing nations also require developers of middle and upper income housing to bear the full costs of localized infrastructure installation. The subdivision standards of the Government of Jamaica, for example, require that developers provide all basic on-site infrastructure facilities, as well as connections to existing public trunk lines, at their own expense, as a condition of subdivision approval. In practice, these regulations apply only to developments for the upper half of the income distribution, since these are the only families that can afford formal-sector housing. However, the relief provided to the public sector investment budget is a critical element in freeing up investment resources for the remaining population. Extricating the public sector entirely from responsibility for providing or financing on-site infrastructure for new, formal-sector development is probably the top priority for making better use of the private sector in an overall infrastructure financing strategy.

Although the idea has not received much practical testing to date, the principle of developer financing of infrastructure also can be applied to low-income shelter markets, particularly sites and services projects. Traditionally, the infrastructure improvements for sites and services projects have been installed and financed by government, and the finished lots have been allocated by a public agency. There would appear to be scope for private activity in this market. If developers are provided use of publicly held land, they could install basic infrastructure networks on their own, and sell the finished lots on the private market. Given the large backlog of demand that exists for well-located sites and services projects, there would appear to be an economic market for these lots, even without the further subsidy that government pricing usually involves. Alternatively, if government wishes to preserve more control over the allocation process, it could buy back the finished lots from the developer at a previously established price. This process, similar to the turnkey arrangements for finished low-income housing, would shift to the private sector the task of initial capital accumulation and risk-taking during the construction stage of infrastructure installation. Developer sales

directly to the low-income market would relieve the public sector entirely of the infrastructure costs associated with sites and services development.

NONGOVERNMENTAL COLLECTIVE SERVICE PROVISION

Not all collective decisions about infrastructure provision and financing need to be made by government. There is a substantial role for neighborhood associations and other groups that can organize voluntary, collective financing.

Neighborhood residents have a shared interest in obtaining local water distribution, community means of disposing of wastewater, or community activity centers. They can organize to obtain these facilities from government through the political process. But if they are unsuccessful, they have the option of acquiring them on their own, without government, or in collaboration with government but without government financing.

Community associations in cities on the north coast of Honduras have organized themselves, allocated costs among their membership, and borrowed funds from local commercial banks, at commercial rates, to pay for street paving and installation of neighborhood water distribution lines, then repaid the loans from assessments on participating members. In Cochabamba, Bolivia, a large informal-sector community organized itself, under the leadership of a community priest, to install water distribution lines serving 15,000 people. All of the labor was performed without charge by community members. The financial costs were covered by private borrowing, and repaid by a community assessment on each household served. The only action required from government in each case was approval of hookup to the main water distribution system. Government gained from the arrangement a swifter extension of the road and water distribution networks at no capital cost to itself.

The opportunities for community-based solutions of this type are manifold. In many parts of the world, community groups contract directly with private firms to provide trash collection service, without going through the public sector. Businesses frequently contract with private suppliers for extra security protection as well as trash collection. At the fringes of urban areas, formal interaction with the public sector for some of these services may not be necessary at all. For example, it may be less expensive to drill a community well and distribute water to local households from it than to connect to the urban-wide water distribution system. In smaller cities in Kenya, Zimbabwe, and other countries a large part of the local infrastructure has been installed through voluntary, mutual self-help of this kind.

A successful public-private partnership, however, requires that the public sector do more than merely adopt a hands-off policy toward community and private initiatives. There should be legal recognition of the role of neighborhood associations in infrastructure provision, and clearly spelled out procedures for handling the capital facilities that are built at community expense. Normally, these are turned over to the public sector for operation upon completion. But there have been cases where the public sector has refused to accept the facilities or to

provide services through them. In other cases, the public sector has accepted them only to discover that they were built to inadequate standards and need replacement at public expense. As in the case of public supervision of private transit systems, then, there needs to be a system for public approval of facilities built at community expense but destined to be operated as part of the public system. There is a similar need for clarification of the legal status of neighborhood associations in dealing with government. Thus the new municipal law, now before the Honduran Congress for consideration, specifically identifies patronatos as partners with local government in infrastructure provision, and spells out the basis of their dealings with the governmental structure.

A further blurring of the distinction between "government" action and other local collective action can be found in the case of Zaire and some other sub-Saharan nations. In addition to taxes, cash payments are made to civil servants in Zaire to finance certain public investments, such as roads or drainage (Prud'homme 1987). As Prud'homme notes, these impositions are "semilegal and semivoluntary. Citizens and enterprises are 'asked' to contribute to a clearly identified project in the form of transportation, materials, money or labour. They do contribute, because they want to remain on good terms with the organizing civil servants, and also because they see that their donation will serve a useful purpose. Salongo, the semivoluntary contribution in labour to public works, would fall into this category." Extra donations of this type to finance local public works are necessary because government's capital budget is so sparse and because a large part of local tax collections are kept by local officials to supplement their civil service pay. Gifts to private, independent, and nonprofit organizations are a further way of mobilizing resources for collective investment in Zaire. For example, the bishop of Butembo (Kivu) raises more than one million zaires every year, and has built a road, an airstrip, a hospital and other works from the proceeds.

II. PROTECTING THE POOR

We have recommended an infrastructure financing strategy that relies more on user and beneficiary payments for infrastructure services, and more on local government tax revenues. Such a strategy runs the risk of placing a heavy payment burden on the poor. National government funds traditionally have been the source of most subsidies for infrastructure services; if these are cut back, in favor of user payments, the cost burden would be shifted from general taxpayers to service users. Such a shift is likely to be regressive because, although most developing countries do not have a highly progressive general tax structure, the income elasticity of consumption of such basic services as water supply is quite low (probably below 0.5 for water). This implies that the burden of user fees will fall disproportionately on the poor, measured as a share of income. Efforts to expand infrastructure coverage are likely to be still more regressive, if users must pay the costs of installation through connection fees, since presently unserviced areas are predominantly occupied by poor residents. Equity issues are further compounded by the fact that in many developing-country cities past on-site infrastructure installations (enjoyed mainly by the middle class and affluent) have been financed from general tax revenues. A shift to user financing would occur at just the time catch-up investment to reach the poor is being proposed.

There are, however, a number of strong steps that can be taken to protect the poor.

INFRASTRUCTURE SERVICE COVERAGE AND SERVICE STANDARDS

The greatest injury to the poor is done by not providing them access to basic services. Without water service, for example, households must devote 3 to 4 hours or more to fetching water from distant points, or buy water from private vendors at prices that have been found to range from up to 25 times the price of publicly delivered water. The willingness of households to pay the full costs of water installation indicate that, burdensome as payments may be, the households are better off paying for connections than going without service.

Service standards in poor areas may be unrealistically high, however. The first strategy in bringing the costs of service provision within the payment capacity of the poor is to lower their true economic cost. A study in Jamaica found that by leaving roads unpaved, bringing water to the lot line where access would be shared by four homes, and reducing standards for depth of water pipes and width of roads, the cost of finished sites for low-income development could be reduced by more than a third. The number of people queuing to purchase such sites was much greater, indicating that the cost savings were worth more to purchasers than the reduction in service standards. Similar findings have been reported in many other locations.

Often, progressive improvements can be made to infrastructure facilities, just as they are to individual housing. If an adequate water line is installed, a community may start with shared outside access, then progress to individual house connections as they can afford them.

Or the community may join together to pave its roads, when resources permit. This strategy builds on the progressive improvements that have worked so successfully for individual house structures.

For very poor areas, threshold levels of services need to be identified, which secure basic health at the lowest cost possible. These may involve standpipes or fountains that guarantee safe drinking water, and public toilets.

TARGETING SUBSIDIES

At present, the subsidies for infrastructure services are spread wastefully among all users, regardless of income level. Smaller subsidies in the aggregate, more effectively targeted, could adequately protect the poor.

There are various devices for achieving better targeting of subsidies. Within the user-fee structure, we have pointed out that it is common to have special "life-line" rates--i.e., rates that are much lower for a basic volume of consumption calculated to be necessary for good family health. Application of this rate system does not require ascertaining the income levels of consumers. Rather, the market is allowed to make this determination. Any household that limits its consumption to the life-line minimum can benefit from the subsidized rate, or all households can benefit from subsidization of consumption up to the life-line amount. Administration of the subsidy thus is simple.

In financing installation of neighborhood capital facilities, government may permit poor communities to pay part of the costs in-kind. That is, the community may contribute the unskilled and semi-skilled labor for road building, digging of pipe trenches, or construction of restraining walls to prevent mudslides. If the national government is sponsoring public works construction as an employment program, it can ensure that the benefits of such construction are steered to the poorest neighborhoods.

The largest capital cost of extending service coverage normally is the not the cost of installing neighborhood-level distribution systems, but the cost of expanding the principal infrastructure networks to reach a new location. These costs most frequently are paid for by government, rather than charged to the user. If the costs of this off-site infrastructure were financed by government only in the case of below-median income housing, and not for other housing, subsidy funds for those who need them would be bolstered and, at the same time, the land market would function more efficiently, by providing economic incentives for middle-income housing to be located where it can be serviced at least cost.

Finally, government may want to provide the threshold level of services without charge. The right to safe drinking water and sanitary means of disposing of wastes may be regarded as so basic that the lowest level of service--standpipes and public toilets--should be provided free. In this case, attention needs to be given to protecting against waste of the "free" service.

Standpipes for which there is no charge often are left to run all day, and impose their greatest loss in terms of wastage. Public toilets for which there is no charge frequently are used to excess, not maintained, and therefore do not function. For these reasons, a very modest user charge, not designed to recover costs, but to discourage waste and to finance maintenance may be appropriate. Special technologies that are cheap, can bear intensive use, and are designed to prevent waste (like coin-operated standpipes that shut off after each use) are also necessary.

PROGRESSIVE USER FEES

Not all user fees are regressive. A vehicle registration fee, or an earmarked tax on vehicles and tires, for example, can pay for road costs and yet be highly progressive in developing nations, where ownership is closely related to income and wealth.

Fees for services whose consumption is not highly income elastic may nonetheless be structured so that the overall fee schedule is progressive. Almost all developing countries impose increasing block rates for water consumption (i.e., the fee per liter of water consumed increases with consumption levels), and since magnitude of consumption is positively related to income, the result is a more progressive distribution of fee burdens (Bahl and Linn). The progressivity of the rate schedule may be sharpened by imposing special surcharges on families that have swimming pools (as is done in Bombay) or on water used for lawn watering.

A progressive fee schedule throughout the range of consumption is necessary if an infrastructure supplier is to be able to cross-subsidize consumers, by charging high-income consumers more than average costs and charging life-line consumers less than average costs. Cross subsidization within a service function is desirable to the extent that it makes unnecessary reliance on uncertain general government transfers to pay for the subsidies. In some countries, cross-subsidization between infrastructure services also is common. For example, the electricity or telephone services may be required to run a surplus, which is targeted to cover a planned deficit in potable water or sewerage operations. This type of cross-subsidization is most appropriate when the services asked to run the surplus are substantially more income elastic (as are telephones and electricity) than the services benefiting from the subsidy. It has a better chance of being administered successfully if the different services fall under a single institution. Continuing transfers from one governmental enterprise to another are at least as difficult to implement as transfers from the general government budget.

Charges on land and land-value increments also will introduce greater progressivity into the allocation of infrastructure costs. Landowners as a class probably are the most able to bear the costs of infrastructure installation, as well as those who benefit most signally from investment. Thus a shifting of development and connection costs from either the general taxpayer or the user is likely to produce a more progressive distribution of cost burdens. As noted previously, it has been common in most large land-allocation projects to extract from benefited landowners part of the economic surplus they gain to pay for related low-income housing and to help pay for the costs of infrastructure servicing for low-income developments.

The same principle can be used for betterment taxation: an overall surplus can be generated that is earmarked to subsidize the participation of the poorest residents in an area.

REGRESSIVITY OF LOCAL TAX STRUCTURE

In developed countries, it has been common for the local tax structure to be more regressive than the national tax structure, with the result that transfer of financing responsibilities to lower levels of government creates distributional problems. There is no technical reason that this should be so in the developing world. Local taxes on property and vehicles, two of the main local taxing sources, would be significantly progressive if applied to true market values. An urban property tax becomes regressive only if property values are not updated, particularly at the upper end of the property scale.

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