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Infrastructure Finance

Volume 2:

Institutional and Macroeconomic Issues

March 1991

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Table of Contents

	Page
Chapter One	1
Chapter Two	14
Chapter Three	32
Chapter Four	65

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.

Chapter One

MACROECONOMIC ISSUES ASSOCIATED WITH INFRASTRUCTURE FINANCE

The capital budgets of developing countries have important macroeconomic implications. These arise both on the expenditure side, in terms of the economic development impact of capital projects, and on the financing side, in terms of the consequences for the macroeconomy of the way capital outlays are paid for.

AN OVERVIEW OF CAPITAL INVESTMENT TRENDS

The macroeconomic impact of capital spending and financing strategies depends in part upon their scale. Truly comparable data on public spending and public investment across countries are difficult to obtain. However, Table 1 displays one summary of recent public expenditure and investment trends. Developing country budgets came under severe pressure during the 1980s, partly because of the squeeze on public revenues resulting from slow economic growth and partly because of the increasing claims of debt service on public spending. Faced with this pressure, countries tended to reduce public investment. The capital share of public budgets is estimated to have declined from more than 37 percent in 1985 to just over 25 percent in 1989. Table 1 shows how public investment declined both as a share of national output and as a share of public expenditure.

Not all public investment, of course, is for infrastructure. In fact, if infrastructure is defined to include water and sanitation systems, roads, bridges, electrical power, and other public network systems, it typically accounts for 15 percent to 40 percent of total public investment. The infrastructure share of the total capital budget tends to be higher in countries where per capita incomes are low, and where basic supporting facilities for national development are being put in place. Much of the variation across countries in the infrastructure share of public investment also reflects the different degree of involvement of governments in direct industrial investment. In almost all countries, the public sector finances the bulk of infrastructure investment. However, public involvement in direct, industrial investment ranges from heavy participation in some countries to a hands-off reliance on the private sector for industrial investment in others.

Table 1

Public Expenditure and Investment in Developing Countries

Year	Public Expenditure as a Share of GNP	Public Investment as a Share of GNP
1985	29.5%	11.1%
1986	30.5%	9.3%
1987	31.2%	9.4%
1988	31.0%	8.6%
1989	32.3%	8.3%

Source: *Alternatives for Capital Financing of Water Supply and Sanitation* (WASH Field Report No. 314, July 1990).

Of the infrastructure sectors, roads and electrical systems are the heaviest users of capital (see Table 2). The nation-wide grids for these systems account for much of their cost. The public investment categories tied most closely to housing development place more modest burdens on public investment budgets. Water supply and sanitation capital investment, for example, typically accounts for 2-5 percent of total public investment. Thus, the macroeconomic effect of financing these latter sectors is largely indirect. They are important for the financing principles they introduce, but the scale of investment is modest enough to mitigate direct impacts on the macroeconomy.

There is a wide array of institutional arrangements for carrying out public capital investment, in infrastructure as in other sectors. In some countries, state corporations or parastatals are responsible for one-half or more of total public investment. Parastatal bodies may be responsible for the principal road, water, and electricity investments, as was true in Colombia, Nigeria, and several other countries in the 1980s. In federal systems, a large part of the public investment burden may be carried by state or provincial governments. The financing of parastatal or provincial budgets, and particularly the deficits run up by these bodies, then become an important part of the macroeconomic linkage to the infrastructure sector. In decentralized systems, the grant and loan programs that channel capital from the central government to decentralized government authorities figure prominently in the macroeconomic picture.

Table 2 illustrates some of these institutional variations for five countries. It also shows the importance of public investment in total gross fixed capital formation (public and private) for each country. The public share of total investment for these countries ranges from roughly two-thirds for Nigeria and Pakistan to less than one-third (and falling) for Mexico.

Table 2

Capital Spending on Infrastructure
(Percent of GNP)

Country	Gross Fixed Capital Formation	Total Public Sector Expenditure	Public Sector Capital Expenditure	Infrastructure Capital Expenditures			
				Total[a]	Water & Sanitation[a]	Power[a]	Roads[a]
Indonesia (1982)	**27.5**	**24.8**	**11.2**	**1.7**	**0.2**	**1.2**	**0.1**
Central Govt.		(21.6)	(10.5)	(1.5)	(0.2)	(1.2)	(0.04)
State Govt.		(3.1)	(0.7)	(0.2)	--	--	(0.1)
Malawi (1982)	**21.4**	**33.0**	**10.3**	**5.1**	**1.0**	**0.5**	**2.3**
Central Govt.				(3.7)	(0.4)	--	(2.2)
Parastatals		(31.9)	(10.0)	(1.2)	(0.5)	(0.5)	(0.0)
Local Govt.		(1.1)	(0.3)	(0.2)	(0.1)	--	(0.1)
Mexico (1982)	**22.9**	**33.3**	**7.3**	**1.7**	**(0.4)**	**(0.4)**	**0.5**
Central Govt. & Parastatal		(28.9)	(6.5)	(1.1)	(0.4)	(0.4)	(0.4)
State Govt.		(3.7)	(0.6)	(0.5)	--	--	(0.1)
Local Govt.		(0.7)	(0.2)	(0.2)	--	--	(0.1)
Nigeria	**31.1**	**33.0**	**20.7**	**7.9**	**n/d**	**n/d**	**n/d**
Central Govt.		(19.9)	(10.3)		n/d	n/d	n/d
Parastatals		(8.6)	(4.3)	(7.7)	n/d	n/d	n/d
State Govt.		(5.1)	(6.0)	(0.2)			
Pakistan	**17.7**	**17.2**	**10.9**	**3.8**	**0.2**	**1.6**	**1.6**
Central Govt.		n/d	(2.9)	(0.8)	(0.2)	(0.4)	(0.3)
Parastatals		n/d	(5.9)	(2.1)	--	(1.2)	(0.9)
State Govt.		n/d	(1.6)	(0.8)	(0.1)	--	(0.4)
Local Govt.		n/d	(0.5)	n/d	n/d	n/d	n/d

a. The sectoral components do not add to the total abecause of the omission of other infrastructure categories.

Source: Urban Institute compilation from country, World Bank, and IMF sources.

CROWDING OUT AND CROWDING IN

One of the most contentious macroeconomic issues surrounding the public capital budget is whether public investment "crowds out" private investment, or serves to stimulate ("crowd in") private investment.

Crowding Out

The original conception of crowding out derives from classical, full-employment models of the economy. Crowding out occurs via the effect of fiscal policy on interest rates. At full employment, additional public expenditures will generate excess demand in the economy, which in turn causes interest rates to rise. The increase in interest rates reduces the level of private capital investment by making some capital projects unprofitable at the new, higher cost of capital. In the classical model of the economy, for each unit of public spending there will be a reduction in private investment equal to

$$(1) \qquad \frac{-i_r}{(i_r + c_r)}$$

where i_r and c_r are the elasticity of private investment and private consumption, respectively, with respect to interest rates (Aschauer, 1988). In the extreme case of a perfectly inelastic savings schedule ($c_r = o$), there will be one-for-one crowding out of private investment. That is, each additional dollar of public spending will displace a dollar of private investment. Note that this effect occurs whether the public expenditure is for investment or consumption, as long as a deficit is incurred that is financed by borrowing. "Crowding out" in this analysis is a financial-market phenomenon associated with public deficit financing.

If the savings schedule underlying relationship (1) is partially elastic, some of the interest-rate adjustment will fall on current private consumption. The increase in interest rates triggered by public spending then induces some increase in domestic savings, leading to a substitution of private investment for private consumption, which offsets part of the crowding out effect on private capital formation.

Crowding out in the classical model is purely a financial phenomenon. Another variant of the argument (David and Scadding, 1974) emphasizes the *ex ante* substitutability of private and public capital. That is, public investment may be viewed by users as a direct substitute for private investment (public investment in steel plants substitutes for private investment; public investment in power systems or telecommunications substitutes for private investments in these networks or their alternatives). Public investment then will crowd out desired private investment, not because of financial effects but because of the effect on desired holdings of private capital.

A large amount of empirical work has been devoted to testing the crowding out effect. Although there is a broad range of individual findings, the majority of carefully specified studies do find that debt-financed public investment crowds out some degree of private investment. (See, for example, Boskin, 1987; Poterba and Summers, 1987; Feldstein, 1982).[1] Most studies assign greatest importance to the classical, interest-rate effect as the route of causation. Studies have also documented the intermediate link in this chain of consequences--the positive effect of government bond issuance on long-term interest rates (Hoelscher, 1987). Although much of the empirical work has been restricted to the United States and other developed nations, there is a professional consensus that debt financing of public spending also crowds out private investment in developing countries (Balassa, 1981; World Bank, 1989).

Practical Conclusions: Crowding Out

The potential for crowding out private investment by debt-financed public investment needs to be taken seriously in assessing public budgets.

There is a tendency in project appraisals, especially those in the housing and urban sector, to neglect crowding out, and instead to claim multiplier and other benefits for public investment financed through borrowing. This analysis requires first that there be unemployed resources in all relevant sectors. It then requires that one of the two conditions described in footnote 1 obtain, if there is not to be displacement of private investment through domestic credit markets. Both of these exceptions involve special cases.

The crowding out argument, in general, deals with domestic credit markets. To the extent that there is an interest-elastic international supply of capital available to a nation, the crowding out consequences of debt-financed public spending can be mitigated. The elasticity of international capital supplies available to the United States, for example, protected the country against the crowding out of private capital investment that would otherwise have resulted from the government deficits of the 1980s. A similar supply of international capital

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1. Two principal opposing viewpoints have been advanced that would mitigate or eliminate crowding out. In Keynesian economics, as long as the liquidity demand for money is interest-rate elastic, households and firms will reduce their demand for cash as interest rates rise, offsetting some of the impact of deficit-financed public spending on interest rates and therefore on investment. In the extreme case of the liquidity trap, additional government spending can take place without any impact on interest rates. This outcome, however, is now seen as a very special case.

   A second theoretical opposing view has been advanced by Barro (e.g., 1981). It represents private savings as a buffer which is adjusted to offset public decisions, in the same spirit of ultra-rationality as advanced by David-Scadding, but in terms of financial holdings. Bond-financed deficit spending is held to trigger an offsetting accumulation of private savings in anticipation of the future tax liability which will be required to repay the public debt obligation. As a consequence of the increase in savings, there is no impact of deficit finance on interest rates. If this happens, there is financial equivalence for aggregate, macroeconomic purposes between debt and tax financing. Use of debt issuance to finance public investment will not crowd out private investment through interest rate effects.

mitigated crowding out at the beginning of the decade for developing countries. Now that international capital flows LDCs have dried up, however, and nations have become much more dependent upon domestic credit markets, the crowding out phenomenon has gained more practical importance.

Finally, it needs to be emphasized that crowding out of private investment by public investment is not necessarily undesirable. To the extent that the two sectors produce indistinguishable capital facilities, as in the David-Scadding interpretation, and do so equally efficiently, it is a matter of indifference where investment responsibility is lodged. In other circumstances, there may well be an under supply of public capital. More generally, there will be standard economic criteria such as externalities in service provision that make an infrastructure project suitable for public or private provision (see Volume 1). If public projects are carefully appraised, so that the rate of return available from them equals or exceeds returns at the margin from private investment, public investment will still be efficient, notwithstanding the substitution of public for private capital spending.

It will always be in a country's development and macroeconomic interest to allocate the total (public and private) investment budget so that projects with the highest returns get financed. Since it is infeasible to centrally appraise and compare all potential projects, a nation needs a set of decentralized rules, so that both public and private investors are confronted with the cost of capital and have strong incentives to invest only in projects whose rate of return exceeds the cost of capital.

Crowding In

"Crowding out" is a phenomenon that occurs through financial markets, or in some variants, as a result of the substitutability between publicly and privately supplied capital in final users' demand for capital services.

However, infrastructure networks also serve as intermediate goods that provide important inputs to private production. The availability of roads or electrical systems, for example, enhances the rate of return to many types of private investment--from manufacturing plants to distribution systems. This complementarity of public and private investment on the production side may more than offset substitutability through financial markets. Public infrastructure investment may "crowd in" private investment, in the sense that a well-executed public capital investment plan will not only satisfy important consumer demands, but will boost private returns to capital investment, and therefore boost private investment levels.

The recent World Bank urban policy paper (1990) emphasizes this private production payoff to public investment as one of the principal connections of the urban economy to macroeconomic performance. It argues that if structural adjustment programs focus exclusively on the size of public expenditures and the size of public sector deficits, because of fear of crowding out of private investment, they can lead to greater reductions in public investment than is desirable. Cuts in public capital budgets provide one of the fastest ways to

bring down public sector deficit financing requirements, and can free up savings for private investment, but reductions in infrastructure investment also can damage the productivity of private investment, thereby leading to less private investment demand.

One type of evidence in favor of the complementarity between public and private investment comes from country case studies. Studies of infrastructure quality in Nigeria, for example (Lee and Anas, 1989) demonstrate the costs inflicted on private business by poor-quality public infrastructure, and the consequent discouragement to private investment. As much as 50 percent of Nigeria's installed electric capacity is inoperable at any given time, mostly because of failures in the public transmission and distribution networks. Faced with this reality, local firms have no choice but to provide themselves with alternative sources of electricity by installing generators to serve their own plants. This duplicative infrastructure investment limits the amount that firms can invest in directly productive capital. Small and medium-sized firms in Nigeria (those with fewer than 50 employees) were found to spend 25 percent of their total investment in plant and equipment or electrical generators, while cutting back on other forms of investment.

More efficient public infrastructure investment, by reducing the price and increasing the reliability of electrical supply, would enhance the cost competitiveness of local industry and open up private investment opportunities. In this case, a better quality public infrastructure system would boost both the productivity of private capital investment and, quite probably, its magnitude.

At a more aggregate level, a great deal of attention has been generated by the findings of David Aschauer (1989, 1990). He formally specifies public capital as an element in the private production function. Or:

$$(2) \qquad Y_F = f(K_F, L_F, K_p)$$

where Y_F is firms' total private output; K_F and L_F, respectively, refer to the firms' direct inputs of private capital and private labor, and K_p is the value of public capital available to the private sector for use in production.

Aschauer then estimates output changes over time in the United States and across the Group of Seven countries as a function of changes in these inputs. By restating the production function, labor productivity (private output per unit of private sector labor) and total factor productivity (private output per unit of combined private sector capital and labor) can be estimated as a function of the intensity of public capital available per unit of private input. That is, just as more private capital per unit of labor will raise private labor productivity, so will the availability of more public capital per labor unit. Or:

$$(3) \qquad \frac{Y_F}{L_F} = g\left(\frac{K_F}{L_F}, \frac{K_p}{L_F}\right)$$

All of Aschauer's empirical results point to an extremely strong effect of public capital, or infrastructure, on private production, private profit rates (the return to capital), and private investment levels. For example, Aschauer concludes that as much as 80 percent of the productivity slowdown in the United States can be attributed to the slowdown in growth of the public capital stock. That is, the slowdown in public investment since the 1970s has led to a decline in the infrastructure intensity of production. This, in turn, is said to have eroded the productivity of private sector inputs. Their estimated impact on productivity is cited approvingly in the World Bank's urban policy statement as evidence of the macroeconomic importance of infrastructure investment.

Aschauer's analysis provides a valuable formalization of infrastructure as an element of private production. However, the empirical results cannot be taken at face value, or indeed, be taken seriously. Any production relationship such as that specified by Aschauer implies a marginal rate of return to public investment, measured by the increases in private output, for each dollar of public investment. Aschauer's various empirical studies *imply annual rates of return to public infrastructure investment in the United States of between 60 percent and 115 percent.* These are three to five times greater than the returns found in cost-benefit studies of individual capital projects, or rates of return for the largest classes of public investment, such as those in the national highway system (Schultze, 1989; Aaron, 1990; Jorgenson, 1991). Aschauer's empirical studies merely pick up the contemporaneous decline in productivity and public investment in the U.S. and European countries and ascribe causal importance to the latter. Any other variable with the same time pattern performs equally well in time series estimates. For example, replacement of public capital by the value of the yen actually improves the statistical fit and attributes the decline in productivity to the yen's appreciation.

Aschauer claims for the productivity payoff to public investment are unrealistically high and should not be used to justify larger infrastructure budgets. Indeed, taken at face value, Aschauer's results imply that a dollar of public capital investment will increase private output by considerably more than a dollar of direct investment in private plant and equipment. If this were true, private business, far from resisting higher tax rates, should be insisting that the government tax it more stiffly, as long as revenue proceeds are used to expand public infrastructure investment.

Conclusion: The Practical Significance of Crowding In

Public infrastructure undoubtedly serves as an intermediate good in private production. A well chosen infrastructure investment plan will increase the cost-competitiveness of private industry and agriculture because it stimulates private investment. This proposition was endorsed by Adam Smith in *Wealth of Nations*, formed the basis for investment in canal and other public improvements on 19th century United States, and underlies the public investment plans of many developing countries. However, the proper way to assess the private payoff to public investment is through the tools of cost-benefit analysis, not through aggregate production functions.

MACROECONOMIC PRINCIPLES OF INFRASTRUCTURE INVESTMENT AND FINANCE

The macroeconomic impact of infrastructure finance needs to be considered, first, in terms of its direct impacts on the national economy, and, second, in terms of the principles it incorporates, since these can easily be extended from "infrastructure" to the rest of the public sector budget or the national credit system.

Optimal Levels of Public Investment

For economic efficiency, the level of public spending on infrastructure should be determined by users' willingness to pay. For consumer services, such as neighborhood water distribution or wastewater collection, the relevant willingness to pay is that of households. Public authorities should supply as much of these capital facilities as end-users are willing to pay for, given the true costs of infrastructure supply. It frequently will be appropriate to augment household willingness to pay in one of two ways. Where there are clear externalities beyond the consuming household (as with wastewater systems), it will be appropriate for the community at large--say, city or regional taxpayers--to cover the externality share of infrastructure costs. Where there are equity reasons for subsidizing the consumption by poor households of basic infrastructure services, national taxpayers can be asked to cover a portion of supply costs. Even in these cases, however, there should be a clear demarcation of the subsidy amounts. Consumer willingness to pay for the residual costs should be used to determine how much, and what kind, of infrastructure to install.

For infrastructure that yields intermediate output for private firms, willingness to pay should be an even clearer output criterion. Public suppliers should price their services so as to recover incremental costs, then let the market reveal the demand for these services. Public policy disputes as to whether there is an "undersupply" of public capital, such as are now raging in the United States, disappear when public authorities price capital services at incremental cost, then adjust their supply to meet demand from households and firms.

Of course, the mechanisms for extracting information on households' and firms' willingness to pay are not always simple. Volumes 1 and 3 in this series address many of the issues involved in implementing this approach. However, the greatest obstacle in developing countries is opposition to the principle of willingness to pay as the determinant of infrastructure supply, not the institutional and other problems involved in application of the principle.

The size of the public investment budget, in summary, should be demand driven, with government acting insofar as possible on market principles in responding to this demand.

Capital Financing Choices

A market-based cost recovery system will pay for the cost of infrastructure capital over its lifetime of service. However, the challenge of financing the initial capital investment remains. There are three basic choices:

✦ Capital investment can be financed on a pay-as-you-go basis from accumulated tax and fee receipts. The macroeconomic effect of this financing strategy is to substitute public capital investment primarily for (current) private consumption.

✦ Capital investment can be financed on domestic capital markets by borrowing. The macroeconomic effect of this strategy is to substitute public capital investment primarily for private investment, and to substitute future public services provided from infrastructure capital for future private consumption.

✦ Capital investment can be financed through the central bank by money creation. The macroeconomic effect of this strategy is to generate excess demand, and to fuel inflation.

In practice, the most common approach in developing countries has been the third, which is also the most harmful in terms of macroeconomic impact. It is preferable to face up to the opportunity costs of capital by having public authorities borrow funds explicitly on credit markets than to obscure the cost of capital by "free" money creation. In fact, if the public sector applies straightforward investment rules, and finances only public projects whose rate of return meets or exceeds the market cost of capital as reflected in the free-market interest rate, macroeconomic efficiency can be achieved under either of the first two financing strategies. The choice between them reduces to a societal choice between greater consumer benefits in the present or future.

Financing Rules for Decentralized Infrastructure Investment

In modern states, much of the investment in infrastructure is carried out not by central government agencies directly, but by decentralized units of government like parastatals and sub-national levels of government. The price signals and incentive structures established to guide the investment and financing decisions of these bodies are important to macroeconomic efficiency, just as it is in the case of housing finance (Peterson 1990a, 1990b).

✦ Public or quasi-public credit systems, like municipal development banks, which are established to lend for state or local capital investment, should function in a manner compatible with the rest of the national credit system. Probably the most urgent requirement of most developing countries' credit markets is to dismantle the system of public credit allocation and public discrimination in credit terms across different sectors of the economy. This sectoral discrimination produces an inefficient allocation of capital. Municipal development banks should not operate on credit terms that try to differentially favor municipal investment, any more than agricultural banks, housing banks, or any other sectoral credit institutions should be established that channel credit on differentially favorable terms into these sectors.

The most efficient way to meet the objective of equal sectoral treatment, and at the same time allocate resources efficiently between consumption and investment, is to have all internal credit institutions lend at the market rate of interest. For municipal development banks, this means communicating the threshold cost of capital to decentralized public investors. Where municipal infrastructure banks presently operate on a subsidized basis, it should be a public priority to move the system toward market-based lending.

✦ Where central-government grants are used to finance sub-national public investment, these should be designed for transparency and stability. Grant elements of finance should be combined with financing from own resources or market-rate borrowing, so that grants cover only the externality portions of investment or equity objectives that are targeted to needy populations. With a grant structure of this kind in place, local governments can make their investment decisions efficiently based upon adjusted willingness to pay.

✦ To control the macroeconomic impacts of decentralized financing choices, the central government may have to impose special controls on state-local borrowing or on the use of money creation through state banks to finance state capital budgets. Note that if states and localities must borrow at the market rate of interest, and select their capital projects rationally so that they recover costs, there is no need for centrally-imposed debt controls. These become necessary when either of the two conditions fail--i.e., when sub-national governments have access to subsidized credit and therefore have an incentive to borrow more than is macroeconomically efficient, or when state-local political leaders do not take the costs of their borrowing seriously and run up indebtedness that they believe they can pass on unnoticed to their political successors. In either case, centrally-imposed credit controls are a second best solution. It would be preferable to adjust credit terms to market rates and to reform capital investment and planning procedures, so that all public capital projects have an expected rate of return that exceeds the market interest rate.

The resort by states to money creation by state banks to finance state investment or other deficits in state budgets is a fundamental problem inherent in federal systems of government. At various points in their histories, uncontrolled state banks have plagued investment financing and national economic policy in the United States, Argentina, Nigeria, Brazil and most other federal nations. In the end, history indicates that the only satisfactory solution to this predicament is to eliminate the money creation powers of state banks, or to curtail their power to finance state budget deficits, either through regulations limiting state banking powers or through controls on the public deficits that give rise to the need for financing.

REFERENCES

Aaron, Henry. 1990. "Comments on Aschauer, 'Why Is Infrastructure Important?'" Paper prepared for the Federal Reserve Bank of Boston Conference on *The Third World Deficit: The Shortfall in Public Capital Investment.*

Aschauer, David. 1988. "Does Public Capital Crowd Out Private Capital?" Occasional Paper SM-88-10. Federal Reserve Bank of Chicago.

_____. 1989a. "Is Public Expenditure Productive?" *Journal of Monetary Economics* 23, pp. 177-200.

_____. 1989b. "Public Investment and Productivity Growth in the Group of Seven." *Economic Perspectives*. 13, No. 5, pp. 17-25.

_____. 1990. "Why Is Infrastructure Important?" Paper prepared for the Federal Reserve Bank of Boston Conference on *The Third World Deficit: The Shortfall in Public Capital Investment.*

Barro, Robert J. 1981. "Why Is Infrastructure Important?" Paper prepared for the Federal Reserve Bank of Boston Conference on *The Third World Deficit: The Shortfall in Public Capital Investment.*

Boskin, Michael J. 1987. "Concepts and Measures of Federal Deficits and their Impact on Economic Activity." NBER Working Paper 2332.

David, Paul A., and John L. Scadding. 1974. "Private Savings:" Ultrarationality, Aggregation, and 'Denison's Law.'" *Journal of Political Economy*. 82, pp. 225-50.

Feldstein, Martin S. 1982. "Government Deficits and Aggregate Demand." *Journal of Monetary Economics*. 9, pp. 1-20.

Hoelscher, Gregory. 1986. "New Evidence on Deficits and Interest Rates." *Journal of Money, Credit, and Banking*. 18, pp. 1-17.

Jorgenson, Dale. 1991. "Fragile Statistical Foundations: The Macroeconomies of Public Infrastructure Investment." Paper present at American Enterprise Institute Conference on *Infrastructure Needs and Policy Options for the 1990s.*

Lee, Kyu Sik and Alex Anas. 1989. *Manufacturers' Responses to Infrastructure Deficiencies in Nigeria*. Discussion Paper INU-50. World Bank.

Peterson, George E. 1990a. "Interest Rate Policy in the Shelter and Urban Sectors." Paper prepared for USAID, Office of Housing and Urban Programs.

_____. 1990b. "Parastatal Policy in the Shelter and Urban Sector." Paper prepared for USAID, Office of Housing and Urban Programs.

Poterba, James M., and Lawrence H. Summers. "Finite Lifetimes and the Effects of Budget Deficits on National Savings." *Hournal of Monetary Economics*. 20, pp. 369-92.

Schultze, Charles L. 1990. "The Federal Budget and the Nation's Economic Health." In *Setting National Priorities: Policy for the Nineties*. Washington, D.C.: Brookings Institution.

World Bank. 1990. *Urban Policy and Economic Development: An Agenda for the 1990s*. Urban Development Division.

_____. 1989. Report of the Task Force on Financial Sector Operations.

Chapter Two

CAPITAL PLANNING AND BUDGETING: PRINCIPLES AND INSTITUTIONAL CONTEXT

1. INTRODUCTION

Sound infrastructure investment requires more than a financing strategy. It also requires a planning or priority-setting process, to ensure that investment funds are spent as efficiently as possible, and a capital budgeting process, to balance sources of funds with outlays.

This chapter identifies some of the critical issues surrounding capital investment planning and budgeting.

1.1 Perspective on Capital Planning

Capital planning lies at the intersection of traditional planning, with its spatial orientation, and traditional budgeting, with its emphasis on project expenditures and the sources of revenue to be used to finance them. In planning literature, the term Multi-Sectoral Investment Planning (MSIP) sometimes is used to describe the process that economists identify as capital planning and budgeting. Although a good deal of planning at the agency or departmental level is required to evaluate individual projects for the capital program, MSIP does not refer to planning at this level, but to the process of combining agency priorities into a coherent overall capital program.

In the simplest paradigm, the capital planning process can be thought of as one by which governments select the final list of capital projects they will carry out. However, governments are able to mobilize capital investments by other means than direct public expenditure. They can make loans or provide subsidies to private firms; they can set up quasi-public development corporations that raise their own financing; they can adopt regulations that require private developers to install infrastructure facilities as a condition of land sales or that require homeowners to pay for road paving along the streets where they live. In this expanded conception, the public capital program consists of all the capital investments that public policy is designed to achieve. The capital planning process should weigh alternative strategies for achieving public investment goals, as well as produce a ranking of projects to be financed directly from public revenues.

It is essential to "multi-sectoral" planning that investment possibilities be compared across different sectors. Such comparisons are difficult enough to construct technically, since the benefits to some investments accrue primarily to consumers while others accrue primarily to producers; different degrees of uncertainty surround projections of future demand; and the benefits of some investments are difficult to quantify. Often, however, investment projects in

different sectors also are embedded in different institutions, each of which has its own planning procedures, its own budget and sources of revenue, and its own legal status. Priority-setting for capital projects may be further complicated by a vertical overlap of institutions. The organization responsible for local infrastructure investments in a certain sector may well by an agency of the national government, rather than part of local government. Constructing a coherent capital budget for a locality or a metropolitan area then requires agreement as to the roles to be played by different institutions as well as establishment of priorities among different physical projects.

2. THE "PLANNING" AND "BUDGETARY" ROOTS OF CAPITAL PLANNING

As noted, capital planning is a marriage of planning and budgeting. Many of the conceptual as well as practical conflicts regarding its implementation arise from the different professional orientation of these two activities. It is impossible to consider design options for the local investment process without first addressing the connection to broader local development planning and to budgeting.

2.1 The Link to Local Development Planning

A quarter century ago it was widely believed (among planners) that a city's capital investment program should simply be "derived from" its comprehensive physical development plan. Through maps and text, an urban master plan was to describe the proposed future land use and infrastructure patterns for a city, 15 to 20 years in the future. The city-wide master plans were to be backed up by detailed sub-area plans that specified allowable land uses on a lot by lot basis. The analogy to an architect's "blue-print" for a building was often stressed. Once the plan was legally adopted: (1) government agencies were to install infrastructure as called for in the plan; and (2) regulations were to force the private sector to build consistent with plan specifications. As to infrastructure, the master plan concept generally recognized the need for translating the plan into multi-year Capital Improvement Programs (CIPs); over the lifetime of the planning horizon, these should produce the infrastructure network visualized in the master plan. Annual Capital Budgets were to be adopted, consistent with the CIP, which itself typically had a three or five-year planning period.

While there are still adherents to this approach, especially among planning practitioners in the third world, the dominant view in the international policy community by the mid-1970s was that the master plan approach had failed. Worse, it had often acted to frustrate development. The most basic criticisms were:

1. Master plans took too long to prepare. Master plan preparation was almost always measured in years, and where the plan had to be embodied in a statutory development order, the process sometimes took decades. This was a serious frustration to top civil servants and politicians who saw enormous urban infrastructure deficits.

2. Master plans seldom offered guidance on the phasing or techniques of implementation. Most important in this regard was the lack of direct linkage to capital improvement programming, in spite of the theory. Master plans showed where the infrastructure ought to go (at least in a general way), but normally said nothing about standards or technologies to be employed or about priorities for phasing implementation over time.

3. Master plans seldom evaluated the costs of the development they proposed, or how they would be financed. For this reason, it was impossible to tell whether the plans were financially feasible. In too many cases, the best guess by hard nosed politicians and finance officials was that a true costing would show that the plans implied outlays far beyond what was affordable. The typical master plan offered no guidance as to which parts of the final plan should or could be scrapped if budget constraints made the whole infeasible.

4. Master plans were seldom based on realistic appraisals of the city's economic potential or likely population growth. Insufficient attention to economic analysis meant that key implementing officials often did not trust the growth forecasts embodied in the plan. While projections of formal-sector job growth often were overstated, projections of population growth typically were underestimated. As a result, "informal" housing development swamped the areas designated for residential development in the master plan, and "informal" business activities spilled out of the zones set aside for commercial and industrial development.

5. Master plans seldom provided a compelling basis for detailed land use controls. Master plans were often translated into zoning ordinances and other land-use controls, but enforcement mechanisms typically were weak. Development occurred that was not consistent with the plan, and planners were often hard pressed to demonstrate that the society was less well-off because of it. Where controls were enforced vigorously, land availability for low-income housing shrank and housing costs increased.

6. Community leaders and implementation agency executives were seldom meaningfully involved in the master planning process. Master plans were most often prepared by professional planners working in agencies cut off both from community expression of infrastructure demands and infrastructure providers' understanding of supply costs.

7. Master plans were infrequently updated. Urban growth is a dynamic process, particularly in the developing world. It is not surprising that master plans became outdated in important ways within a few years of their adoption. This would not have been a problem if the plans were frequently updated. However, the initial plan preparation effort was normally an expensive, multi-year affair. Governments could not afford to update the process frequently enough to keep pace with development.

Looking across such criticisms, McNeill (1983) suggests that "the single most crucial factor...has been the failure of implementation. Traditional master plans with a strong spatial/land-use bias, have simply had no significant effect on action...Whether or not the

objectives of such plans were laudable, this type of planning is being abandoned because of its patent failure to achieve results."

The Project-by-Project Approach. As these problems were evidenced in the 1970s, the usual government response was not to formally dismantle master planning mechanisms, but rather to tacitly allow the plans to be ignored. Agencies were to concentrate on identifying feasible capital projects and expediting their implementation without worrying too much about demonstrating "conformance to the plan."

No one advocated that this be done in a haphazard manner. International donors urged that projects be carefully appraised, including subjecting them to cost-benefit analysis. Even consistently thorough project-by-project review, however, does not assure coordinated movement to address local priorities. It is possible to select a list of projects all of which have respectable cost-benefit ratios individually but which taken together still exhibit internal conflicts and gaps in relation to important local needs.

The problems associated with uncoordinated project-by-project activity were becoming more apparent by the early 1980s: publicly financed sites and services projects might be placed in one part of the metropolis, while job growth occurred in distant zones inaccessible by public transport; water providers might focus on extending their networks in one area while road builders were giving priority to another.

The capital resource constraints that followed from the worldwide recession in this period made such mismatches harder to tolerate and concern about them became more vocal. At a World Bank conference in 1985, the central theme raised by developing country representatives was, "the need to come to grips with the problems of the city as a whole and to strengthen the institutions that will be needed to manage unprecedented rates of urban growth in the coming decades..." K.C. Sivaramakrishnan (now Secretary of India's Ministry of Urban Development) argued: "Urbanization is a process and there is no way you can deal with it exclusively on a project basis...We do want (urban) projects to continue, but we want their focus to be wider" (World Bank, 1986).

The Search for a New Coordination Mechanism: Structure Plans and Action Plans. In most countries, the search is underway for some better planning mechanism as a basis for coordination. Options considered thus far generally borrow some features from the master plan but make changes to diminish the past problems with that approach. The most frequently discussed alternative is the "structure plan" (sometimes also called a "guide plan," "framework plan," or "indicative plan.") This type of plan is more general than a master plan. Maps indicate only: (1) the broad magnitudes and spatial directions for land development; (2) routing of the major elements of transportation and other infrastructure networks; and (3) the placement of major facilities such as airports, hospitals, and universities. They do not attempt to specify detailed lot-by-lot land use or local road configurations. Structure plans do have to indicate reasonable approximations of the amount of land to be provided and the

approximate population to be accommodated on it. However, because of their lesser detail, these plans can be updated more swiftly to adjust to the changing reality of demand for land.

Structure plans are supposed to give more emphasis to the sequencing of development and focus on major determinants of urban form, in particular environmental factors. The preparation of the structure plan for metropolitan Jakarta (Jabotabek) in the early 1980s is a good example. Analysis showed that both infrastructure providers and private developers in Jakarta were incrementally moving into the worst areas environmentally (marsh lands along the coast at the north and the watershed to the south). The plan contained a reasonable assessment of economic and demographic prospects and demonstrated that the estimated growth could be accommodated at lower cost and avoid major environmental hazards by shifting development directions to the east and west. As major infrastructure elements (roads and water/sewer trunk lines) are being built consistent with the plan, early indications suggest that private development (informal and formal) is generally adjusting to the proposed pattern with very little explicit "control."

Still, some experiences suggest that structure plans are not a fail-safe solution. In Great Britain, for example, structure plans were the cornerstone of the planning system adopted in the Town and Country Planning Act of 1976. Under this approach, structure plans were to be prepared for urban regions and then be backed up by more detailed local plans nearer to the old master plan concept. A Green Paper prepared by the Department of Environment in 1986 found that many of the old complexities and rigidities remained in the system and recommended scrapping the approach. The average time taken for preparing and approving a structure plan since the inception of the process had been 4-5 years. The detailed local plans, when they were prepared at all, often failed to build on the framework established by the structure plan.

As an antidote to top-down analytical planning, many planners have come to advocate "action plans." Action planning proceeds from the view that planning should deal with live policy choices and with short-term investment decisions. The complexity of context, which master plans try to analyze as their point of departure, can be discovered as implementation of the action plans proceeds. As an example of this style, consider the community upgrading programs of Tegucigalpa, Honduras. These undertook to bring neighborhood-financed connections to the public drinking water system, as well as road paving, to the spontaneous settlements on the steep hillsides surrounding Tegucigalpa. The first years were quite successful in expanding household water connections, but as implementation progressed it became apparent that the expansion in connections was exacerbating pressure on Tegucigalpa's already limited water supplies. Water rationing in other parts of the city (in the form of designated hours or days of the week when piped water would be supplied) had to be intensified as system-wide demands for water consumption increased. As middle-class alarm over water restrictions heightened, both local and international planners reacted with three policies: (1) a crash campaign to obtain international financing for building a dam which would augment raw water supply; (2) an interim policy of drilling localized wells to supply water to informal communities without drawing on the city-wide piped water supply; and (3) a

sharp reduction in new connections in areas where local wells were infeasible. Although not without its problems, this process illustrates the fundamental strategy of action planning: to push toward the solution of a genuine problem (lack of water connections in informal settlements) in the most direct way until a constraint is encountered; then, shift the planning focus to how best to eliminate that constraint.

Together, simplified "structure plans" and a series of policy-oriented "action plans" can provide the framework needed for planning the local capital investment program and capital budget. The structure plan indicates where public investment ought to be focused and how different sectoral investments need to be coordinated. The action plans indicate the investment projects needed to achieve specific policy goals. Setting priorities in the capital budget then comes down to setting priorities among a limited number of internally coherent action plans.

The Bias toward Spatial Planning. Although a structure plan together with goal-specific action plans can provide a framework for the capital budget, they retain a bias toward spatial planning. The prototypical "action plan" is a plan for community upgrading or for integrated development in a certain location. The "structure plan," though simpler and less prescriptive than the master plan, is still built around a map of what the city should look like in spatial terms.

Planning in support of the capital budget also requires other types of plans. It will require a plan for public service coverage; that is, a plan that sets realistic targets for coverage of piped drinking water, paved roads, elementary schools, garbage collection, and other basic services. Although this plan necessarily will have a spatial dimension, its most important characteristics will be such things as a pricing and financing strategy (including an assessment of consumer ability and willingness to pay for a particular public service at different income levels, a decision about how to use public subsidies, and choices regarding the quality, technology and cost of service to be provided.)

Some part of capital expenditures must be used to repair, replace, and upgrade components of the existing infrastructure network. Decisions about these expenditures should be based on a "maintenance plan." Again, the maintenance plan will have a spatial dimension, but this will be less important than the policies established to guide repair and replacement investment, and their rationale. (e.g., Should infrastructure components be replaced based on their age, their physical condition, their current ability to provide useful output, or other considerations; and, given any of these criteria, at just what point should the maintenance, repair, or replacement decision be made?)

The capital budget also finances investment projects for economic development. The local economic development plan will have spatial characteristics. However, the spatial parceling of economic activities is generally less important than the planners' assessment of what type of economic development a locality should pursue, given external demand for production and the local relative cost position, and what type of public support will be

necessary for its success. As a result, economic development planning is only secondarily spatial planning.

The tendency for planning offices to think primarily in spatial terms often has led the finance or budget offices responsible for preparation of the capital budget to set up their own planning and analysis teams, rather than rely upon planning professionals for the analysis that underlies capital budget choices.

2.2 The Link to Budgeting

If traditional planning has set forth development goals with scant reference to their cost implications, the budgeting tradition works in the reverse direction. Its emphasis has been on overall resource constraints, the specific sources of revenue to be used to pay for each investment project, and the compatibility of the capital expenditure budget both with global revenue limitations and with the mix of capital revenues that is identifiable.

In its most frequently recommended form, the local capital budget consists of a list of projects, grouped by policy purpose, with a cost estimate and source of financing identified for each project. The total of the expenditure side of the budget is balanced against total projected capital revenues (e.g., grants from higher level governments, surplus from the local operating budget, earmarked capital investment funds, proceeds of local bond issues or borrowings from municipal development funds).

For our purposes, three aspects of capital budgeting are most pertinent.

Iterative Budgeting. When the financing constraint is taken seriously, it provides the framework for priority-setting in the capital budget. Choices about which capital projects to implement, or how to reduce costs by cutting back on the scale or technology of individual projects, must continue until planned capital spending is brought into line with identifiable financing resources.

This is an iterative process. The total cost of planned capital projects almost always will exceed the financing constraint. Once the list of projects passing the planners' threshold of desirability has been prepared, their costs need to be compared with capital revenue projections to estimate the magnitude of the financing gap. The project list then should be pared down by applying some evaluative or ranking criteria. Projects that closely complement one another or are mutually necessary for the success of an integrated development plan should be bundled together and approved or postponed as a group.

The iterative adjustment of capital spending plans and capital revenues takes place on both sides of the budget. Once it becomes apparent which projects will have to be postponed or cancelled because of financing limitations, political officials may judge it worthwhile to try to relax the financing constraint, either by increasing local revenues or by focusing campaigns to obtain more financing from higher levels of government.

An example of iterative capital planning is provided by the Capital Investment Folio process adopted in metropolitan Manila under international donor sponsorship.

> Under the Community Investment Folio (CIF) process, a development plan for metropolitan Manila was first formulated which served as the structure plan against which capital projects could be evaluated. Then, the financing requirements for all projects "approved" by investing agencies were calculated. The capital costs for the planned projects were found to total P$19.8 billion for the period 1985-89. Separately, an estimate was made of probable capital financing. This projection took into account economic growth forecasts, the budget condition of the national and local governments, and salient public policies, such as the stated priority of shifting national capital expenditure away from Manila to the rest of the country. Total capital resources available over the period were projected to be in the range of P$8.3 billion-P$12.8 billion, with the lower figure thought to be more realistic. The exercise established the approximate size of the capital financing gap, and led directly to the next stage of capital budgeting--the application of consistent evaluative criteria to whittle down the list of capital projects to a priority set that would fit within the financing limits.

The capital financing constraint is only one of three budget constraints that ought to be analyzed in preparing a capital program. For large new capital projects, a *pro forma* operating budget should be prepared. This tests the economic and financial feasibility of operating a capital facility, once it has been built. There should be an explicit plan for covering operating and debt service costs through a combination of customer charges and public subsidies. Moreover, both of these elements should meet the test of feasibility--i.e., customer charges should not exceed consumer willingness to pay, as revealed by past operating experience or special surveys, and the subsidy levels that are needed should not exceed the budget capacity of the responsible public agency.

A third budget constraint concerns ongoing maintenance. Once installed, the capital facility will require routine maintenance, intermittent repairs, and occasional replacement of parts. The costs of the maintenance plan need to be projected and reconciled with the budget of the responsible agency. Too often, the cost implications of operating and maintaining the capital plant are ignored altogether, with the consequence that infrastructure facilities become a recurring drain on public finances or are allowed to deteriorate into uselessness for want of upkeep. The capital planning process should include the simple expedient of identifying the agencies responsible for operations and maintenance of all proposed capital projects and having them sign off on their capacity to finance ongoing operations.

Although the discipline introduced by revenue constraints is the key to productive capital planning and budgeting, most capital budgets in the developing world in practice avoid acknowledging even the capital financing constraint. The actual capital budget remains a list of

desired projects, most of whose financing sources either are unidentified or optimistically listed as donations from national government agencies or international organizations. The capital budget thus becomes a lobbying document. Local politicians take these lists to petition for funds at the national level or, depending upon the size of the city, in their international meetings. One consequence is that, despite the ostensible rigor of the budget process, the capital budget remains an undifferentiated list of "desired" projects, unshaped by local taxpayers' or politicians' willingness to pay and unranked as regards their priority for local development. Peterson (1988, 1989) found that in both Bolivia and Honduras over the period 1980-87, the average city carried out less than 20 percent of its approved capital budget, because revenues never materialized to finance the rest. Over the period 1976-79, Dodoma, Tanzania financed 27 percent of its formally approved capital plan. Elsewhere, including the developed world, financing experience has been similar. Over the period, 1970-78, Detroit, Michigan, for example, actually implemented less than one-quarter of its approved capital budget.

The failure to take budget constraints seriously is probably the most signal failure of the capital planning process, for it implies that there is no need to prioritize projects to fit within resource limitations. Project wishes are merely articulated in the capital budget, in the hope that some external donor will provide the resources to make them come true.

Earmarked Revenues. The theory of capital budgeting assumes that all capital projects can be rank-ordered in terms of priority. Starting from the top of the priority list, officials can work their way down the list until they exhaust the financing sources available to them, taking care to consider highly complementary projects as a group rather than singly.

The reality of capital budgeting deviates from this model. In most developing countries, the great majority of investment projects are financed from earmarked revenues that must be used to finance a specific project or type of project. It is not unusual for as little as 10 percent of local capital revenues to be "general" revenues that can be allocated as planners prefer. The remainder of the capital budget consists of projects financed by national or international agencies, which can be reallocated to other uses only at great effort, it at all; or projects financed by dedicated revenue sources--e.g., gasoline taxes which must be used for road construction, or revenues from water sales which must be used for water system improvements.

The realities of project financing dictate that many lower-rated capital projects are implemented, at the same time higher-rated projects are suspended, because earmarked revenues are available to finance the former, whereas the general revenues that must be used to finance the latter have been exhausted. Over longer planning periods, local officials have some ability to influence the allocation of funds received from higher levels of government or international donors. A comprehensive, prioritized capital plan thus still has value as a reference point. It serves a role for capital planning equivalent to that which the structural plan performs in establishing a framework for spatial development.

However, the importance of dedicated revenues means that the annual capital budget, as well as shorter-horizon capital planning, must be "built up" from segregated components, rather than expressed as a single comprehensive listing of projects in order of priority. The capital projects to be financed from earmarked revenue sources should first be identified. The residual, unconstrained portion of the capital budget then can be planned around these projects. If there is an especially egregious mismatch between the unconstrained priority list and the constrained list (i.e., if markedly inferior projects must be undertaken because of revenue set asides), the institutional barriers that necessitate steering funds to low-rated projects can be addressed.

In the United States, federal transportation programs formerly included large amounts of set asides earmarked for construction of new extensions of interstate highways within metropolitan areas. As citizen resistance to major highway construction grew, many states and localities chose to defer construction even though 90 percent federal funding was available for financing. At the same time, capital funds for mass transit systems and repairs of existing roadways were sharply curtailed, forcing many localities to forego high-rated capital projects in favor of low-rated highway extensions, or risk losing the federal funds altogether. Local governments campaigned for relaxation of the federal financing constraint, initially winning the right to case-by-case waivers permitting transfer of the funds to other local transportation projects and eventually winning general authority to substitute other types of transportation projects for new highway construction.

Budgeting Techniques to Support Capital Investment Planning. Several budgeting techniques are designed specifically to facilitate the linkage between budget preparation and budget monitoring, on the one hand, and capital planning, on the other. Where these techniques are not used, it becomes more difficult to capture investment priorities in the budgeting process.

Multi-Year Rolling Capital Programs. The capital planning process requires a multi-year perspective. Typically, a series of investments must be undertaken in order to achieve certain development objectives. Since it is beyond government's capacity to finance or build all of these projects at the same time, a multi-year (typically three- or five-year) program of investments should be formulated. Budget preparation then should conform to this perspective. Projections of the three- or five-year financing requirements to pay for the capital program should be prepared, along with estimates of actual annual financing flows over the period. As time proceeds, actual investments can be monitored by measuring them against the schedule called for in the capital program. At the end of each fiscal year, the capital program for coming years should be modified in light of the investment actually undertaken in the year just completed, as well as in light of any changes in priorities or long-term resource constraints. A new year should then be added to the end of the capital program to keep its time horizon constant. The existence of such a rolling capital program makes it easier to focus on priorities,

since it requires both planners and budgeting officials to identify the consequences for out-years of any decision to postpone or scrap altogether investment projects in the current year.

Program Budgeting. "Program budgeting" has generated a good deal of controversy. Like any budgeting technique it can easily be too formalized or made too demanding to be practical. However, common sense program budgeting is essential to good capital planning. Under this approach, individual investment projects (planned for either the current year or out-years) will be grouped together under the program or objective they are intended to serve. One kind of program grouping is spatial. All of the projects, across different sectors, intended to open a new geographic area for development, for example, would be grouped together, so that the total capital cost of the program can be identified and the progress of inter-related capital projects can be monitored. Another kind of program grouping is by policy. It may be local policy to replace all water supply facilities of a certain type (e.g., to upgrade standpipes in a certain zone to home connections over a five-year period or to replace all bridges that are closed to motorized traffic because of weight limitations). By grouping these projects, the cost of implementing the policy can be estimated, and the changes in cost that would result from changing the replacement policy can be projected.

Separating Maintenance from Operations. One of the most common conditions in developing countries is that capital facilities, once built, are inadequately maintained. Frequently, one of the highest returns to investment can be obtained by spending enough on maintenance and repairs to ensure that existing facilities are kept in serviceable condition and do not have to be replaced prematurely. Judgments about the cost effectiveness of maintenance cannot be made, however, unless maintenance is broken out as a separate category in the current budget. The budget for each functional area should separate maintenance from other aspects of service operations.

2.3 The Tension between Capital Planning and Capital Budgeting

The conflicting perspectives of "planning" and "budgeting" frequently manifest themselves in the capital investment process. Ironically, it is often true that the more seriously the revenue constraint on the capital budget is taken, the smaller the role that planners play in preparation of the capital program. When prioritizing of the capital budget is formalized, economic rates of return, the ability to finance operations and maintenance, local community support for development projects, and the effectiveness of capital outlays in stimulating economic development or job creation gain importance as ranking criteria, relative to conformance to spatial development plans. The very importance of the revenue constraint assigns more prominence to the analysis of alternative financing sources. The capital program and the capital budget badly need planning. But the need is for "planning" that can decide investment priorities by trading off many different types of community objectives, without giving exclusive or undue importance to spatial development.

3. PRIORITIZING THE CAPITAL PLAN

Multi-sectoral investment planning should compare investments in different sectors along at least two dimensions. First, all investments *compete* with one another for scarce capital resources. Therefore, they should be ranked in terms of priority within the capital budget constraint. Second, many projects complement one another in function, and so should be planned and implemented as a package. One example where coordination is necessary concerns the integrated development of new land areas within a metropolitan region. Another example occurs in economic development planning where, depending upon the mix of economic activity to be encouraged, local planners may have to provide for a sectorally-linked strategy that provides land for industrial development, establishes transportation connections between the new work zones and workers' residential zones, upgrades regional infrastructure services (such as the reliability of electricity generation), expands port facilities to handle exports, and installs local infrastructure networks for industrial waste removal. The economic returns to each of these initiatives should be evaluated in light of the other investments that will be carried out.

It is an important lesson of capital planning, however, that not all individual projects need to be traded off against one another as part of a comprehensive priority-setting process. Instead, governments should look for ways to *simplify* and *focus* the process.

3.1 Selecting Investment Strategies

One way to focus the capital planning effort is to identify investment *strategies* that cut across sectors. Such strategies do not replace the need for individual project evaluation, but they provide guidelines as to types of investment needs or opportunities that sectoral planners should look for.

Sometimes the choice of a priority investment strategy can be made by comparing investment opportunities according to a single criterion, such as the economic rate of return. For example, if existing infrastructure facilities have been allowed to decay badly, it may be straightforward to demonstrate that the return to repairing or replacing water pipes and electricity transmission lines exceeds the rate of return to new investments to expand supply. A multi-sectoral *strategy* that gives greater importance to repair and maintenance therefore is appropriate. In other cases, there may be a political mandate to integrate spontaneous settlements into infrastructure service networks. A multi-sectoral *strategy* of community upgrading is appropriate, and guidelines to sectoral planners should be prepared accordingly.

In a series of studies in Lagos, Nigeria and other African countries, the World Bank has urged a fundamental shift in metropolitan capital investment priorities to give greater importance to maintenance and repair of existing infrastructure systems. Expensive capital systems inherited from the colonial period have been allowed to deteriorate, not only leading to poorer quality road, water, electricity and other systems, as well as intermittent total breakdowns in service, but also escalating the future costs of system restoration. Bank studies estimate that the economic rate of return to priority repairs now far exceeds the rate of return to new investments.

In Nigeria, studies have found that private firms have been forced to invest large sums in on-site electricity generation and other private infrastructure supply in order to compensate for poor-quality public supply (Anas and Lee, 1989). More than 10 percent of firms' total investment in plant and equipment, for example, is accounted for by on-site, electricity generating facilities, which deliver electricity at an average of 30 times the economic cost of public supply. However, the poor condition of public transmission lines and the unavailability of spare parts has produced so many interruptions of public electrical service that firms have found it necessary to absorb the higher cost of private supply. Maintenance, repair, and upgrading of existing facilities therefore makes sense even as an economic development strategy.

In the Pusan, Korea Urban Management Project, an assessment of investment choices across sectors found that the city could "achieve the greatest immediate benefits by shifting from large and highly visible new works to a range of smaller investments that permit the full use of existing infrastructure. For example, measures to integrate subway and bus systems--including new bus routes, road improvements, and transit terminals--will enable the city to get greater benefits from the subway system at relatively little additional cost." (Courtney, 1988) Thus, the theme proposed for the next capital planning period was to consolidate the networks that had been so drastically expanded by large new investments in the previous period.

In the capital investment plan prepared for the Jakarta metropolitan region in the early 1980s, the predominant theme is one of shaping urban growth to reflect the analysis contained in the region's structure plan. Trunk roads and trunk water and sewer lines were planned so as to shift growth to an east-west axis, thereby reducing development costs and avoiding environmental hazards (Jabotabek Advisory Team, 1981).

3.2 Establishing Priorities through Policy Rules

A second way of simplifying priority-setting within the capital program is to establish ongoing *policies* regarding certain types of capital investment. The policy guidelines then can be turned over to the implementing agencies, which are able to carry out on their own initiative investment projects that satisfy the guidelines. In this way, the central planning and budgeting unit avoids the need to review and rank all individual projects.

> The state of Uttar Pradesh, India implemented a far-reaching decentralization program that transferred capital resources and discretion over capital planning to local authorities. However, there was apprehension that some local authorities would use the capital funds solely for new social projects. Consequently, simple guidelines were established guaranteeing that other investment purposes would be funded. Sixty percent of district investment must go to "productive" schemes, while a maximum of 40 percent can be used for "nonproductive" (social) investments (Sanwal, 1987).

> The Calcutta Metropolitan Development Authority has incorporated policy priorities into the grant and loan structure it offers to local government units. The grant share of funding is 100 percent for slum upgrading; one-third for drains, parks and roads; and zero for markets and water supplies. The latter projects are judged capable of generating sufficient revenues to be self-supporting. Within the matching grant framework, local governments in principle are free to select whatever mix of capital projects they prefer (Banerjee, 1988).

Decentralization of capital investment decisions work best when the implementing agency generates its own source of capital income, and the policy guidelines cover both project investment choices and financing. For example, the basic investments necessary to keep the existing water distribution system operating (investments in pumping stations, pipeline repair and replacement, storage facilities) can be internalized to the water agency, *if* economic consumption fees are charged and the water agency funds its investment budget from fee income. The water agency itself should prepare annual and five-year capital programs, showing the consumption fees that are necessary to self-finance the capital budget. Central agency planners can review the capital plan as a whole, but have cause to examine individual projects only if the cost implications of the capital plan, as presented, are unacceptable.

In other cases, once policy guidelines have been established, the investment choice can be left to market demand, as expressed by individual households or community organizations. For example, if local government establishes the policy that it will automatically extend household water connections to any community willing to pay connection costs, the capital planning process is greatly simplified. Each settlement must then decide for itself whether it is willing to

pay for household service, given the costs of connection. As long as there is full cost recovery, a community's choice has no implications for the overall capital funding constraint, and so the investment need not be weighed as part of a comprehensive priority-setting process.

Even where there is a policy of subsidizing the capital costs of household connections for low-income settlements, policy guidelines can permit decentralized capital planning and implementation. The central planning and budgeting unit's key responsibility then is to establish the size of the capital subsidy it will provide the water system for this purpose, as well as possible guidelines regarding subsidy allocation (e.g., subsidies per household should not exceed a certain level in any project; household connections should not be subsidized in new developments that violate spatial development priorities). Implementation of the policy can be left to the water authority, with periodic central review.

In Zaire, water system investment was stymied for many years by the need to submit all planned investment projects, including coverage expansion, for central planning review. Proposed projects were evaluated as part of a comprehensive consideration of all investment proposals in all sectors, and were subject to the vagaries of overall capital financing availability.

As the national water supply and distribution agency, REGIDESO, gained in administrative competence and cost recovery, it became possible to decentralize the water investment process. REGIDESO and the government negotiated a formal "Contrat-Programme" agreement. For its part, the government 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 capital assets. REGIDESO and the government further agreed that REGIDESO would 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. The projects contained in the five-year plan do not need further authorization as part of a central government annual budget review. For its part, REGIDESO pledged to finance at least 40 percent of capital investment from internally generated earnings (Regie de Distribution d'Eau, 1988).

Although it remains to be seen whether all the provisions of this agreement will be met in practice, the model of a negotiated agreement concerning a capital program and capital finance, which then permits decentralized implementation, is highly promising.

3.3 Prioritizing Projects

Even after the central planning and budgeting unit has simplified capital priority setting as much as it can, through the adoption of cross-cutting investment strategies and policy

guidelines that permit decentralized project selection, there will remain the task of deciding which major projects should be funded within the limited resources of the capital budget.

Simplification of decision-making procedures is even more important at this stage. Central unit consideration of individual projects should be limited to large projects. Otherwise, priorities can be expressed between *classes* of projects--e.g., community upgrading projects vs. new land development, or economic development projects vs. environmental protection. The criteria for ranking should be easily understood and straightforward.

The Community Investment Folio process for Manila illustrates the effective use of priority-setting criteria. The process first screened out projects that, though they appeared on agencies' project lists, were insufficiently developed or had no possible funding source. Small projects were grouped by type of activity. All projects or classes of projects then were scored on a scale of 1-10 according to different evaluation criteria. The criteria included (a) socio-political acceptability, (b) government budgetary requirements, (c) debt servicing requirements, and (d) economic rate of return. Rankings were made under alternative assumptions about future economic growth. Based on this analysis projects were grouped into first, second, and third priorities. First priority investments included, among others, job and income generation, slum upgrading, garbage collection, and sites and services projects. Third priority programs included a primary roads program, sewer rehabilitation, and the construction of completed housing units. For highly ranked projects, a further investigation of agency implementing capacity was carried out, before the projects were placed in the recommended Core Investment Program.

3.4 Building Capital Planning Capacity Incrementally

Largely because local government staff capacity in developing countries has been notoriously weak, this section has emphasized techniques for both simplifying and focusing the capital planning process. Another way to address this weakness is to develop planning capacity incrementally rather than trying to install it full scale at the outset.

Indonesia's Integrated Urban Infrastructure Development Programme (IUIDP) offers an illustration of an incremental approach (see UNDP/GO1, 1989, and Kingsley, 1986). IUIDP is a process in which technical assistance from the central and provincial levels is provided to selected local governments to help them develop their own processes for project identification and capital budgeting. Efforts to recruit and train local staff for this work are built into IUIDP. The notion is that assistance from higher levels of government will be gradually withdrawn as local capacity is strengthened.

Even in the first stage, the local government must make certain basic commitments: (1) to conduct the capital planning process on an annual basis in the future under consistent

rules; (2) to develop three-year rolling capital budgets; (3) to develop some basic spatial concept as a guide to decisions (a quickly developed structure plan or master plan update); and (4) to prepare a capital budget indicating how each year's list of projects is to be financed (implying agreement to take the revenue constraint seriously).

In other respects, however, IUIDP's first stage is much simpler than a full-fledged multi-sectoral investment planning. Most important, it starts with only a few infrastructure elements (i.e., water, sanitation, solid waste disposal) with the notion that others (e.g., roads, electric power, public facilities, etc.) will be added in later years after the process has proved itself and developed political momentum. Also, project identification and prioritization are done in a quite simple manner at the outset with the expectation that more sophisticated techniques can be applied once staff capacity has been strengthened.

This sort of incremental development would also be advisable in later stages which the typical "public" capital program is expanded to encompass "mobilizing investments by other means than direct public expenditures" as suggested in the Introduction. Once a traditional public capital programming process is underway, the next step would be to invite others to participate. There are at least three categories of other actors:

1. Other public agencies that make capital investments but for a number of possible reasons (e.g., reliance on different funding sources) are not included in the local capital budgeting process. Examples are public housing and land development agencies or parastatals that may be developing facilities in the locality.

2. Private institutions whose investments are encouraged by (often subsidized by) the public sector: e.g., private firms that develop land or construct facilities on a turnkey basis for government or under some other public-private partnership arrangement (see discussion in Section 7).

3. Other major private investors and developers active in the locality. These could include public interest oriented NGOs and CBOs as well as private firms (see discussion in Section 7).

At first, such participation might only entail listening to and commenting on presentations of the strategy behind the public capital budget and its analytic foundations. The chances for conflicting actions by the private and other public sector investors should be reduced if they have this understanding. This would in fact address what is often an important problem. Private developers in a number of countries complain that uncertainty about the location and timing of government infrastructure investments is one of the major risks they face.

In the next stage, the planning staff might collect data on the tentative investment plans of all such institutions before final reconciliations begin. Also, these other institutions might be allowed to participate in sessions that set the capital budget strategy and select policy priorities

(being able to make comments and discuss alternatives even if they have no role in final decision making). Where this occurs, the regular capital budget planners would have a better basis for their decision making. Even though the process would not bind outside organizations, better information about the plans for public investment, and its intended consequences, should help rationalize private investment. The capital plans of other public agencies and public-private partnerships might be published as an informational addendum to the final public capital program.

In still later stages, the other public agencies and public-private partnerships might become formal participants in the planning process, subject to (or at least some of) its controls (see further discussion in Section 7).

There is one other dimension along which capital planning might develop incrementally. A number of large urban agglomerations in the developing world are now politically fragmented. There may be, for example, a large central city government, a number of legally independent suburban jurisdictions, and yet other special purpose agencies with independent responsibilities for selected infrastructure elements. Frequently, political constraints prevent the legal integration of such entities. Even in such cases, however, it may be possible to gain their joint participation in an informal planning process. A process like this has been implemented in the Cleveland metropolitan area in the United States as jurisdictions there recognized that: (1) the lack of coordination was raising costs for all of them; and (2) they would be in a stronger position to bargain for central government and state funds if they could present a coherent capital program for the metropolis as a whole (Peterson et al., 1983). In the Cleveland program, a nongovernmental "Growth Association" collected the proposed five year capital plans for all of the relevant jurisdictions and presented them in an integrated document, along with analysis to point out potential conflicts and aggregate funding requirements. The process has been repeated each year since 1983 leading to adjustments in the programs of individual jurisdictions as well as successful joint campaigns to enhance financial support.

4. INSTITUTIONAL COORDINATION AT THE LOCAL LEVEL

No complaint is more commonly found in development planning than that the different agencies charged with capital planning, implementation, and financing fail to coordinate with one another. In many cases, investment planning is carried out both by the local authority (as mandated by legislation governing planning or local government) and the relevant sectoral agencies (who do so because they have responsibility for actually carrying out works in their sectors). These conflicts can lead to costly duplication of effort and incoherency between local and state/national plans. Moreover, planning at every level often is overridden by budget agencies, reacting to immediate financial constraints.

In Colombia, prior to the decentralization reforms of 1986, local governments shared responsibilities with upwards of 20 national departments and parastatal agencies for the provision of public services such as water and sewers, electricity, education, and health, as well as related capital planning. The situation was confused even further by the fact that local government boundaries did not match agency administrative areas. Cut off from most sources of revenue, local governments lost even their coordination role, as the powerful parastatals had no motivation to defer to local planning preferences.

There is no single institutional resolution to the problems posed by lack of coordination in capital planning and budgeting. However, *some* institution at the local level should have responsibility at least for compiling a single capital investment program from the project lists of individual agencies, wrapping these in an explanatory text with accompanying maps, and enunciating the basic policies that should shape agency investment selection. This body should simultaneously have strong links with local government, if it is not itself a part of local government, and with national/state government. Once the entire set of planned capital projects affecting an urban region has been laid out in a single document, conspicuous incompatibilities among projects can be pinpointed and attacked. Appropriate strategies for tying together sectoral investments can be debated.

It is not necessary to wait for formal institutional reorganization to achieve greater practical coordination in capital planning. The spatial coordination of sectoral investments, for example, typically encounters little bureaucratic resistance. Very simple administrative systems often are enough to achieve coordination at this level.

Planners often remark ruefully that their jobs would be far easier if there were a single institution at the metropolitan level which combined the planning, financing, and implementation functions for capital development. The Metropolitan Development Authorities found in several of the large urban regions of Southeast Asia come close to actually incorporating this model of urban development. However, their experience demonstrates that consolidating capital-related functions under a single roof does not always guarantee effective coordination.

The Calcutta Metropolitan Development Authority (CMDA), for example, is one of the largest capital development agencies in the world Among its 5,000 employees, it counts 100 qualified planners, 500 graduate engineers, 3,000 junior engineers, and many economists, financial experts, and social scientists. The CMDA has the statutory obligation of coordinating and integrating urban development activities for the metropolitan region. It controls virtually all financial flows for public investment, acting to channel national and state grants and loan programs, and issuing its own development bonds (Rs. 200 and 250 million in 1986 and 1987 respectively). It oversees the preparation and coordination of the capital budgets of local governments, the metropolitan sewer and water authority, the land development agency, and others. The Chief Executive Officer of CMDA is a senior civil servant with the rank of departmental secretary, who is able to resolve conflicts with state agencies at the state secretariat.

Even in this model, however, there are complaints about coordination. "The planning sector (of CMDA) is ignored by the operation sectors (of CMDA); its 'programme development' (guidelines) more often than not are side-stepped by project implementing departments. The appraisal, monitoring and evaluation unit (which performs economic appraisals of projects)...is an anathema that the CMDA had to accept at the insistence of the World Bank, but never took seriously...(It) cannot play the critical role of linking planning with implementation." (Banerjee, 1988). Faced with the technocratic and financial power of CMDA, local government has lost control over prioritization of development projects, and there have been low levels of community participation in planning.

A frequent complaint is the failure to coordinate street disruptions across different sectoral agencies. The Public Works Department repaves a street, and shortly thereafter the Sewer Agency digs it up again to replace a sewer main. No sooner has this work been completed than the Gas Company, Electricity Company, or Telephone Company needs to make underground repairs. In Kingston, Jamaica these disruptions have been overcome by the simple expedient of having each infrastructure agency circulate a notification to the others three months in advance of planned street work. The other organizations then can check their maintenance and repair plans to see if they plan work on the same street segment. If so, the organizations find a mutually satisfactory schedule to do the work at the same time. In Kingston, a private, not-for-profit company, the Kingston Restoration Company has taken on the job of serving as the secretariat for such notifications. The system has worked smoothly, since no organization's bureaucratic turf is threatened by the cooperation.

In Dhaka, Bangladesh, it was recommended that the least disruptive way to secure sectoral coordination of capital planning was simply to have sectoral and other agencies with capital investment responsibilities copy extracts from their annual budgets for all projects affecting Dhaka, and send these to a common unit. A small flexible budget then could be established to fill the gaps between sectoral investments.

5. STRENGTHENING THE ROLE OF LOCAL GOVERNMENT IN CAPITAL PLANNING

Historically, different countries have placed the primary responsibility for capital planning and investment at different levels of government.

National. Some countries traditionally have carried out even local planning at the national level. Pre-1985 Indonesia is a clear example of central planning. All local investment plans and budgets were prepared by central staff in the capital (Jakarta) and implemented in the field by central government employees working from regional branch offices.

State or Regional. In federal systems, state or provincial governments often recognized important capital planning roles. India's national planning process, for example, sets investment allocations geographically, but state governments play the primary role in deciding which projects will be pursued and on what schedules. In Brazil and Nigeria states also perform key planning and financing functions.

Parastatal. The predominant Latin American model has been one in which quasi-independent central agencies (parastatals) have responsibility for local service delivery, planning, and investment, sector by sector. Many of these so-called Decentralized Service Authorities were set up during the 1950s and 1960s to bypass both national and local governmental structures, in an attempt to avoid politicization of infrastructure supply.

Local. The United States is one of the few countries in which local governments traditionally have planned, financed, and implemented the majority of public capital investments on their own.

Among developing countries, variants of the national model clearly have predominated. At independence, a highly centralized administrative system often was a part of the colonial inheritance.

Decentralization of infrastructure planning and financing, however, has become a strong trend of the last decade (see case studies for 10 countries summarized in the Appendix). In part, this trend reflects the realization that urban infrastructure is difficult to plan and control from the center. Lack of coordination in the placement of schools, water lines, and roads is more apparent and frustrating to local citizens than to planners in the capital. Standards that work well in one city are often inappropriate in another. By the start of this decade, centralized national infrastructure providers in many countries were being besieged with complaints from localities, which wanted to be able to set their own local investment priorities. Often, a still more important factor in decentralization has been the central government's recognition that the costs of infrastructure provision will be immense. National leaders began to question the political wisdom of continuing to accept full responsibility for the infrastructure bill, and have been influenced by the view that local residents will probably be more willing to pay for services if they have a greater choice in planning them.

The institutional forms of decentralization have been almost as varied as the legal and historical backgrounds of the countries implementing it. Five basic models, however, generally illustrate the range of experience.

5.1 District Development Committees (DDCs)

This approach to decentralized investment planning is predominant in East African countries (e.g., Kenya, Zimbabwe), which have a history of British administration. While elected local councils existed previous to recent decentralization efforts, most infrastructure was provided by central ministries with little involvement by the councils. The DDCs are intended to be the primary coordinating body at the local level, both for developmental planning and capital programming. District-level and national plans are supposed to be prepared concurrently as part of the Five Year planning, with information about planning priorities and funding exchanged between the two levels of government.

The system, as it has evolved in Kenya, carries some obvious tensions. Although the DDCs are supposed to set local development priorities, they do not have control over their own resources, but are dependent upon the central line ministries to budget to meet the locally identified priorities. Proposals to allocate 5 to 10 percent of the development budget as block grants for discretionary district use have gotten nowhere. Separation of the planning structure from the budgeting apparatus has tended to create too many project proposals, which the budgeting mechanism is ill-equipped to discriminate between. From the central perspective, district planning has concentrated too heavily on social projects, to the exclusion of income generating works.

5.2 District Councils

This model is adapted from the DDC approach, but addresses some of its critical faults. As implemented in Karnataka, India, District Councils have been given clear responsibility and authority over the state-level implementing agencies and direct control over the allocation of financial resources. The state government has appointed a number of senior officers to staff each Council and recognized that the district development plans formulated by the Councils will be the basis for investment. Representatives of line ministries in the district report directly to the council on all matters except those involving more than one district. Councils have discretionary control over funding from the state consolidated fund as well as resources (such as fees and rents) raised within the district.

In Sri Lanka, a variant on the District Council model has had Members of Parliament from each district sit on the district council to increase its political access at the national level. The Ministry of Plan Implementation has placed a Government Agent and planning officers in each district to serve as staff resources.

5.3 Metropolitan Development Authorities

The Metropolitan Development Authorities represent an attempt at technocratic decentralization. The lack of capacity in local government is often the reason given for setting up the DA. The DAs are charged with the task of coordinating land development and capital investment to ensure that the metropolitan master plans (most prepared in the 1960s) are implemented. They have broad powers over metropolitan capital investment and planning. However, higher levels of government also have institutional reasons for establishing DAs, since they allow the central/state government to maintain control of urban development policy and funding while by-passing interference or opposition from local governments. In Nigeria, where the Urban Development Boards function as DAs, staffing is provided exclusively by state-level employees, and most Boards receive 100 percent of their funding from state government. The bureaucratic identification of staff with the national or state civil service has weakened their local orientation.

5.4 Phased Decentralization

As noted earlier, Indonesia has had one of the world's most centralized infrastructure delivery systems. As a unitary state, it has only recently begun to create workable local governments. Local planning boards with some independence were established in the late 1970s but were not equipped to implement investment programs. A number of fairly large urban centers still do not have their own local governments independent of those of their rural hinterlands. Recognizing that it would take some time to build adequate local capacity, Indonesia initiated its Integrated Urban Infrastructure Development Program in 1985 as a phased approach to decentralization. In the first stage, centrally funded teams work with local officials, helping them to design their own capital improvement programs and establish revenue generation initiatives. In the process, they identify capacity gaps and begin to address those gaps with recruitment and training. At the same time, national legislation is being modified to permit local governments to tap a wider range of revenue sources. As local capacity develops, the plan is to gradually withdraw technical assistance from the center.

5.5 Full Decentralization

In this model, the central (or state) government confers both decision-making authority and adequate untied resources on local government. Locally elected bodies then fully control a large part of the investment budget. Unlike models 1 through 4 above, local political leaders rather than government officials play the dominant role in determining local investment priorities.

Colombia provides one example of this drastic approach to decentralization. Local governments in 1986 for the first time were given discretion in setting local property tax rates to finance locally determined budgets. The share of national value added tax receipts transferred to the local level was raised from 30 percent in 1986 to 50 percent in 1992. The additional transfers are projected to reach US$950 million annually by the latter year, and must be used principally for capital investment. Additionally, Colombia's financial institutions have adjusted their lending procedures to leverage this future stream of revenues into immediate investment, by lending for infrastructure projects that are secured by the future tax transfers. The decentralization legislation also calls for the central government to withdraw from financing various types of local infrastructure, thereby offsetting part of the cost of revenue transfers, but leaving local governments with a much greater share of untied resources (Calderon, 1988).

Another example of sudden decentralization is found in Guatemala, where the new constitution requires that 8 percent of all national tax revenues be transferred to local governments for capital investment purposes. This step has increased local capital budgets by an average of more than 10 times. Community councils have been set up to determine local investment priorities. The theory behind these drastic measures is that local participation in capital planning will take hold only if local authorities are given significant resources to

allocate; and that the sudden availability of capital resources will generate a network of private-sector advisors that can provide local authorities with the professional expertise that otherwise would be available only from the central government.

From these various attempts at decentralization, perhaps three central lessons can be drawn:

--Decentralization of infrastructure planning and priority-setting works best when the decentralized authorities have direct control over at least part of their investment resources, and must work within their own budget constraint.

--Decentralization of planning responsibilities must be accompanied by steps to strengthen local capacity to plan and budget. Most countries have relied on secondment of central or state level staff to provide this expertise. However, it is also possible to draw on the network of private planners, engineers, and financial analysts that now exists in most countries.

--Technocratic decentralization is less likely to strengthen local control over infrastructure priorities than decentralization that explicitly recognizes political roles, and increases the political authority of local government units.

6. PLANNING FOR THE REVENUE SIDE OF THE CAPITAL BUDGET

Multi-sectoral investment planning traditionally has dealt with priority-setting for the expenditure side of the capital budget. However, as was emphasized earlier, capital programming is an iterative process. No revenue constraint is completely fixed. Faced with urgent investment demands, public authorities always have the option of relaxing the capital budget constraint by raising additional public revenues or borrowing capital funds. In fact, from a purely economic perspective, it always will be rational for public authorities to treat the revenue side of the budget as an "endogenous variable"--that is, public capital investment should be undertaken as long as (and only as long as) the social returns to public investment exceed those realizable at the margin from private investment. This is too formalistic a criterion to be of much practical guidance in capital planning, but the real-world correlate is that when capital projects beyond the funding cutoff point in public priority lists still command strong public support and yield high rates of return, government should expand the capital budget, either by increasing capital revenues or reallocating public expenditure from the operating budget to the capital budget.

For multi-year capital programming, a strategy for building the revenue side of the capital budget is just as important as a strategy for setting investment priorities within present budget limitations. Preservation of capital funding is likely to be especially important now, when budget pressures have led to steep reductions in infrastructure investment by central governments. In the current economic environment, the retrenchment in infrastructure

investment is unlikely to be temporary. Debt-servicing pressures as well as taxpayer resistance to general tax increases make it probable that central government budget constraints will remain tight. 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 investments beyond the levels proposed in national budgets.

Under these conditions, it is prudent to plan a *local* strategy for strengthening the revenue side of the capital budget. The issues associated with financing the capital budget are discussed in the companion paper to this one.

7. PUBLIC PLANNING FOR PRIVATE INVESTMENT IN INFRASTRUCTURE

In most countries the public sector does not have the capacity to provide all the infrastructure needed by its rapidly growing urban centers, or at least the capacity to do so efficiently. The future will require the encouragement of more private sector involvement in infrastructure provision almost everywhere. If this is to occur effectively, however, the public capital planning process will have to recognize it and find ways to guide it coherently in relation to purely public investments.

Section 3.4 suggested how the conception of the public capital budget could be expanded into a broader process that includes various private and quasi-private actors. Here, we say more about the types of private entities likely to be involved and the special implications for capital planning.

1. ***Contractors to Public Agencies.*** A number of functions in infrastructure provision, maintenance and operation are now being contracted out to private firms. These range from quite limited activities (e.g., leak detection in water systems) to much broader responsibilities (e.g., developing major roads or housing schemes to be handed over to government on a turnkey basis when complete). Since all of the final planning decisions in these cases remain with the responsible public agencies, such contractors should not be expected to play a major role in the MSIP process. However, limited involvement of the most important of them, for informational purposes at least, would undoubtedly be helpful.

2. ***Private Firms Dependent on Public Support.*** The conception of the public capital budget should be expanded to directly include infrastructure investments that are being constructed and financed by the private sector, but encouraged and sometimes subsidized by the public sector. If the (public) Estates Development Corporation of Jamaica, for example, decides to provide private-market developers with public lands at below-market costs, in return for the developer's installation of roads and the local water distribution network, this is a shift in strategy for implementing the public capital plan, not abandonment by the public sector of its interest in infrastructure installation. Once built, in fact, the infrastructure facilities will be turned over to public entities for operation.

3. ***Community-Based Organizations.*** The public sector has often been slow to provide basic infrastructure to low-income (informal) settlements. Stimulating the establishment of CBOs that can provide much of the basic infrastructure for themselves (with or without direct government support) should be a major tenet of public policy in the 1990s. Some public support (financing, technical assistance, etc.) is likely to be needed in many cases. Decisions as to where and when it should be provided should be made as a part of the formal capital planning process and the interested CBOs should participate, at least informally along the lines suggested in Section 3.4.

CBOs should be encouraged to participate in the MSIP process, however, even when they are not self-providers. They can be canvassed at the outset to alert public planners as to their views on the needs and priorities of their communities, and they can be involved in hearings and reviews after the overall public program has been prepared in draft. A number of U.S. cities (St. Paul and Seattle, for example) have divided their territories into communities; community boards are involved at several points as the capital program is being prepared. Such active involvement with all communities, however, is costly and may well be too ambitious a goal for newly established MSIPs. It may be more reasonable at the start to involve only a few CBOs (i.e., those in communities that will be most strongly affected by next year's overall investment priorities) and add others in later years as capacity permits.

4. ***Public Interest-Oriented NGOs.*** Another type of entity of growing importance in urban development is the public interest-oriented NGO. Examples include local Cambers of Commerce and other business coalitions that are starting to play a proactive role in furthering local economic and infrastructure goals. Such entities can contribute useful ideas to public planners as the capital program is being shaped and they can be helpful in advocating the program to others (potential funders, voters, etc.). For these reasons, they should be at least informally involved in the MSIP process. While some NGOs may be directly interested in only a few individual infrastructure projects, others may play a leading role in the overall planning and coordination function, in many cases influencing a broad range of actors more effectively than would be possible by government employees. In Guatemala, for example, the NGO, Water for the People, has acquired decades of experience in designing and installing small-scale water systems in collaboration with local residents. The NGO recently has taken on a formal contractual role in planning water system development in some localities.

5. ***Private Firms Providing Their Own Infrastructure.*** Lee and Anas (1989) examined how different types of private manufacturers in Nigeria have responded to the lack of adequate public services. It is common there for firms to provide a large part of their own infrastructure to make up for deficiencies in public supply. They found, however, that because of insufficient scale economies, the unit costs of decentralized private provision were typically much higher than what would be expected from efficient public provision. However, institutional constraints are likely to prevent adequate centralized public provision for many years. Lee and Anas recommend that in the interim, governments encourage "shared production" by private firms, rather than regulating against it as they have done in the past. For

example, several firms could build one large power generator to meet mutual needs. Other types of "utility pools" could also be established to take advantage of economies of scale in infrastructure provision. Similar approaches are likely to be appropriate in other countries. Public regulatory reform in this case can be a direct substitute for more costly public capital investment. Appropriate regulatory change should be considered as part of the capital planning process, with representation of official private industries.

Generally, as private involvement in infrastructure provision expands, there will be a greater need for monitoring. Tracking investments by private firms and assessing their cost efficiency to the public sector and the economy as a whole will be vital in deciding what variants warrant support in future strategic planning.

8. CONCLUSION

Too often, the expenditure and financing sides of the capital budget are developed independently. The "financing problem" then is reduced to the issue of how to raise capital funds--that is, how to pay for the proposed list of capital projects. Since capital funds in the required magnitude typically cannot be raised, the usual capital budget in developing nations goes largely unfunded, and many of the individual projects composing the capital budget are postponed or eventually cancelled. In these circumstances, actual investment priorities tend to be set by international donor organizations, who are willing to provide funds for targeted types of projects.

The principal lesson of this chapter is that capital planning and budgeting must be an iterative process. Project planning from the outset should take account of the capital budget constraint. At each stage of budget adjustment or budget approval, the entire range of cost-reducing options should be weighted. Public capital expenditures can be cut not merely by dropping projects altogether, but by redesigning them to less costly standards, or shaping them so as to increase the rate of costs recovery, or of shifting some of the expenditure responsibility to the private sector. The goal of this exercise always should be to produce a realistically balanced capital budget, whose projects actually can be built, and which reflects the budget-constrained priorities for investment.

REFERENCES

Anas, Alex, and Kyu Sik Lee. 1988. "Infrastructure Investment and Productivity: The Case of Nigerian Manufacturing, A Framework for Policy Study." World Bank Discussion Paper INU 14. Washington, D.C.

Banerjee, Tapan K. 1988. "Issues in Financial Structure and Management: The Case of Calcutta Metropolitan Area. Paper prepared for Expert Group Meeting on Issues in Financial Structure and Management. Nagoya, Japan: United Nations Centre for Regional Development.

Caiden, Naomi, and Aaron Wildavsky. 1974. *Planning and Budgeting in Poor Countries.* John Wiley and Sons.

Calderón, Mario R. 1988. "A New Role for Municipalities in Colombia." Paper presented to the USAID Washington Policy Conference.

Courtney, John M. 1988. "Improving Urban Infrastructure Planning and Investment: The World Bank Experience." *The Urbanization Revolution.* Edited by Richard May, Jr. New York: Plenum Press.

_____. 1978. "Urban Land Use Regulation." *Urban Land Policy Issues and Opportunities.* Edited by Harold B. Dunkerly. World Bank Staff Working Paper No. 283. Washington D.C.: May.

Department of Environment (Welsh Office). 1986. The Future of Development Plans, HSMO.

Dunkerly, Harold B. 1978. "Urban Land Policy Issues and Opportunities - An Overview. *Urban Land Policy Issues and Opportunities.* Edited by Harold B. Dunkerly. World Bank Staff Working Paper No. 283. Washington D.C.: May.

Goodman, L. J., and R. N. Love (eds.). 1980. *Project Planning and Management.* New York: Pergamon Press.

Hatry, Harry, Annie P. Millar, and James H. Evans. 1984. *Guide to Setting Priorities for Capital Investment.* Washington, D.C.: The Urban Institute Press.

Hatry, Harry, Kevin Neary, and Joan Allen. 1986. *The Capital Investment and Maintenance Decision Process.* Urban Institute Project Report to the National Council on Public Works Improvement. Washington, D.C.

Hayuma, A. M. 1981. "Dodoma: The Planning and Building of the New Capital City of Tanzania." *Habitat International.* 5:5-6.

Hicks, Norman L. 1988. "Expenditure Reductions in Developing Countries." Washington, D.C.: World Bank Asia Country Department-II.

Hulme, David. 1988. "Project Planning and Project Identification: Rational, Political, or Somewhere in Between?" *Manchester Papers on Development.* IV:2.

International City Managers Association. 1955. Local Planning Administration, Municipal Management Series. Washington D.C.

Jabotabek Advisory Team. 1981. "Jabotabek Metropolitan Development Plan: Executive Summary, Report No. I/1." Directorate General of Human Settlements, Department of Public Works. Jakarta, Indonesia: Government of Indonesia. December.

Kingsley, G. Thomas. 1986. "Managing Urban Development: An International Perspective." *Spatial Implications of Economic Development Policy.* Proceedings of a Seminar convened by the Town and Country Planning Association of Jamaica. Kingston, Jamaica: July.

Knight, Gloria, and Bruce Golding. 1988. "Jamaica's National Shelter Strategy - Government as Facilitator." Case Study Presented at the Washington Policy Conference, sponsored by the Office of Housing and Urban Programs, USAID.

Lee, Goh Ban. 1988. "The Future of Urban Planning in Malaysia." *Habitat International.* 12:4.

Lee, Kyu Sik, and Alex Anas. 1989. "Manufacturers' Responses to Infrastructure Deficiencies in Nigeria. World Bank Discussion Paper INU 50. Washington, D.C.

Linn, Johannes F. 1983. *Cities in the Developing World: Policies for Their Equitable and Efficient Growth.* New York: Oxford University Press.

McNeill, Desmond. 1983. "The Changing Practice of Urban Planning." *Habitat International.* 7:56.

Moskow, Michael H. 1978. *Strategic Planning in Business and Government.* New York: Committee for Economic Development.

National Commission on Urbanization. 1988. *Report of the National Commission on Urbanization.* Volumes I and II. New Delhi, India: Government of India.

National Urban Development Strategy Project. 1985. *National Urban Development Strategy Project Final Report.* Report T2.3/3. Directorate General of Human Settlements,

Department of Public Works, Government of Indonesia, and United Nations Center for Human Settlements. Jakarta, Indonesia: September.

Ogediz, Selcuk. 1983. "Managing the Public Service in Developing Countries: Issues and Prospects." World Bank Staff Working Paper No. 583. Washington, D.C.: The World Bank.

Peterson, George E. 1988. "Bolivia Urban Development Assessment." Washington, D.C.: The Urban Institute.

_____. 1986. "Financing Shelter-Related Infrastructure." Paper prepared for Infrastructure Strategy Study. Nairobi: United Nations Centre for Human Settlements.

_____. 1984. "Honduras Shelter and Urban Assessment." Washington, D.C.: The Urban Institute.

Regie de Distribution d'Eau de la Republique de Zaire. 1988. "Water Supply Provision in Zaire." Paper presented to the USAID Washington Policy Conference.

Rivkin, Malcolm. 1978. "Some Perspectives on Urban Land Use Regulation and Control." *Urban Land Policy Issues and Opportunities*. Edited by Harold B. Dunkerly. World Bank Staff Working Paper No. 283. Washington D.C.: May.

So, Frank S. 1984. "Strategic Planning: Reinventing the Wheel?" *Planning*. American Planning Association. February.

Taylor, John, and David Williams. 1982. *Urban Planning Practice in Developing Countries*. Oxford, England: Pergamon Press.

United Nations Center for Human Settlements. 1989. "Appropriate Standards for the Regulation of Land Use: Analysis and Synthesis Report." (Draft). March.

"Urban Development: Thinking Big Enough?" 1986. *The Urban Edge*. 10:2. Washington, D.C.: The World Bank. February.

Chapter Three

DESIGN CHOICES FOR REDUCING URBAN INFRASTRUCTURE COSTS

Volume 1 of this report examined the effectiveness of various approaches to financing urban infrastructure. But if the costs of proposed infrastructure systems are substantially out of line with what urban residents can afford, more effective financing tools alone will not close the gap. City officials must evaluate options for cost reduction as well as (and in relation to) financing alternatives. This chapter offers a framework for thinking about the cost side.

Specifically, we define a range of possible cost reduction strategies and examine the potential impacts of each. Do some approaches generally yield a higher payoff than others? Are some more trouble than they are worth? While there have been many studies of infrastructure costs in various countries, none has been specified in a manner that supports unambiguous answers to these questions in the country at hand, let alone universal ones. However, the review does suggest some guidelines.

THE OBJECTIVE: NOT TO *MINIMIZE* COSTS

It is important at the outset to emphasize that the choice among infrastructure alternatives should be based on the ratio of benefits to costs (whether weighed qualitatively or actually estimated)--not costs alone. The point is relevant because a focus on cost reduction has become near ideology in some circles and it is possible to take it too far.

As late as 15 years ago, there had been little systematic analysis of the costs associated with urbanization or their affordability. Practitioners in developing countries built housing and infrastructure systems at high standards, first because that is what their college text books had told them to do. And then a number of real incentives reinforced the selection of high standards, not the least of which was fear arising from the fact that careers normally collapse when structures do (or when there is substantial public outcry over health crises due to infrastructure failures).[1]

Among national policy makers there was a general perception that urban infrastructure was, by definition, extremely expensive. This high cost image is one of the foundations for the anti-urban sentiment that pervaded development policy for most of the post-colonial

1. See Gakenheimer and Brando (1988) for a comprehensive review of the incentives that continue to cause many public officials, materials suppliers, and others, as well as design engineers, to press for unrealistically high standards.

period. The few broader assessments that were conducted tended to reinforce this perception. Prakash (1977), for example, estimated that the investment required to provide housing and infrastructure for the expected internal migrants to Asia's cities over the last two decades of this century would exceed the region's expected total domestic product.

Although the concepts had been advanced before,[2] it was not until the late 1970s that a different view on costs began to take hold on a broad scale. It started with the rationale for the sites and services approach. Given available resources, it would be impossible for governments to serve more than a negligible fraction of the urban poor if high standards were maintained. Instead, by concentrating only on the provision of small parcels of land with basic infrastructure (but without housing), and requiring the beneficiaries to pay what they could afford for them, available resources could be spread across a much larger share of those in need. Experience in many countries has since shown that when poor households acquire a serviced site on this basis, they may well build only crude shelters at first, but they are likely to apply their own resources to building much improved housing on the site over time.[3]

Several studies conducted in the 1980s applied this logic at the national level. The first was PADCO's analysis for Egypt (1982). The government had adopted extremely high urban development standards and the analysis showed that accommodating all new urban dwellers at those standards would be, by a wide margin, a fiscal impossibility. The analysts then designed and priced lower cost alternatives and demonstrated that decent and safe basic infrastructure could be provided at 52 percent of the per capita costs implied by the high-standards approach.

An analysis for Indonesia (NUDS/PADCO, 1985) explicitly compared the costs of reasonable infrastructure packages to accommodate projected urban growth with fairly conservative estimates of the possible future level and structure of domestic investment and concluded the approach would be affordable. Richardson's comparison of these and other similar studies (1987) indicated that even drastic reductions in standards would not make decent urban infrastructure affordable everywhere in the near term, but that in many countries the prospects were much more optimistic that the earlier conventional wisdom had assumed. Acharya and Mohan (1990) estimate that India's yearly urban infrastructure investment through the rest of this century will have to go up to about twice what it was in the early 1980s. Even so, after reviewing resource mobilization potentials, they conclude, "the cost of

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2 For example, Calcutta's *Basic Development Plan* (CMPO, 1965) advanced the view that the lack of low cost basic infrastructure (water supply, sanitation, drainage, street lighting) was more important to slum dwellers that the structural quality of their housing. Since the former was affordable and the high quality housing was not, low cost solutions without new housing should be the basic approach to residential development and *bustees* (slums) should be improved in line with this principle (not removed).

3 Reviews of World Bank assisted sites-and-services projects by Keare and Parris, 1982, and Strassman, 1982, indicated that once sites were provided the amount of savings mobilized for home building by the new residents was considerably above what analysis of their incomes suggested would be possible. Since they could arrange for construction themselves, they tended to build more quickly and almost all eligible for building material loans drew down the maximums to which they were entitled.

providing basic urban infrastructure in India can be kept within manageable limits in the foreseeable future provided that modest standards are maintained."

This approach--reducing standards in order to reduce costs to create more equitable self-sustaining delivery systems--has now caught on among many urban professionals. It is a sound idea, but some of its proponents have carried it too far, attempting to cut costs to the absolute minimum. In some cases they have slashed initial capital costs without considering the implications for longer term maintenance. Given the poor maintenance practices of most developing countries, the World Bank, for example, has concluded that urban roads ought to be built to *higher* initial construction standards, so that they can withstand high levels of vehicle (especially truck) use without severe and rapid surface deterioration.[4] In other cases, countries have cut standards below levels the beneficiaries felt essential and could have afforded. One example is projects with lot sizes that are too small to permit households to build an extra room to be rented out or to use their home sites in other ways to earn essential income. Another, is where residents who would have paid the full cost for the convenience of water service to their individual homes, are provided only with communal water taps and are reluctant to pay even a much smaller amount for them.

At the city scale, cost minimization could be a more fundamental threat. It has been thought for some time that per capita infrastructure costs are normally higher in large cities than in smaller ones. The NUDS/PADCO study (1985) confirmed that this was true for Indonesia, but indicated that the main reason was higher infrastructure demand from economic activities as city size increases. In this case, cost minimization (not providing sufficient infrastructure to support business needs) would surely constrain job generation and income growth. It does not make sense to "give" (i.e., provide subsidies for) more infrastructure per capita to larger cities. But it does not make sense, either, to prevent them from having better facilities if users are willing to pay for them. Studies do suggest that while infrastructure costs are higher for cities than rural areas and generally higher for large cities than small ones, the benefits may well be higher still; i.e., smaller settlements probably do not yield as much value added per unit of infrastructure investment.[5]

The challenge to the designers of urban infrastructure systems then is to find solutions that will yield the highest benefit-cost ratios given the circumstances at hand and not simply to reduce costs. Still, the national studies noted above do suggest that traditional infrastructure systems are often much more expensive than they need to be. Cost reduction efforts, therefore, are clearly warranted.

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4 See unpublished draft report on Urban Transport Policy.

5 It has not been demonstrated that benefit/cost ratios increase regularly with city size. In fact, it seems quite likely that due to congestion costs in the largest cities some more dynamic medium sized centers may be more efficient. Nonetheless, it is doubtful that small settlements contribute as much to economic growth per unit of infrastructure investment as those in the medium and larger size classes. See Mera, 1973, and comments by Linn, 1982.

COST REDUCTION STRATEGIES

With this perspective, what alternative means are available for reducing infrastructure costs? Although there are others,[6] here we focus on methods related to varying physical parameters. There are three types of **variable cost determinants**: (1) service levels; (2) system technology; and (3) intra-urban densities and spatial patterns.

1. Service Levels. Costs can be reduced by varying service levels in two ways: first, by reducing the quantity of service provided to customers (e.g., cutting back on the amount of water or electricity made available to them) or by maintaining lower coverage ratios among potential consumers. Both could occur without unreasonable loss of benefits depending on the circumstances; e.g., where customers have been over-consuming water because it is underpriced or where households or firms do not require water provided via a public infrastructure system. Examples of the latter are found in Indonesia where, in many areas, ground water is plentiful. It can be accessed by hand pumps and shallow wells at less cost than needed to pay for a full public system, and without serious health risks (except at higher residential densities where there is a greater likelihood of pollution).

2. Technology. Cost reductions here occur by: (1) choosing less expensive basic systems options (e.g., on-site pit latrines instead of piped sewer systems); (2) cutting physical standards within a chosen option (e.g., smaller dimensions or less costly materials for pipes or road surfaces); and (3) adjusting the size of system components to realize economies of scale where these are operative (e.g., it is generally cheaper to serve a given city with a small number of large sewerage treatment plants than with a large number of small package plants).

3. Spatial Pattern and Density. Infrastructure costs can also be reduced by: (1) encouraging higher density (more compact) urban neighborhoods--they have less space between buildings and thus require shorter lengths of roads and pipe systems; (2) discouraging spatial fragmentation (vacant spaces) between neighborhoods (i.e., "sprawl)--again to reduce the lengths of collection and distribution networks; and (3) focusing urban expansion in zones whose physical features permit lower development costs (i.e., avoiding zones with steep/rugged terrain, bad natural drainage, or bad access to water sources).

Cost reduction strategies for particular urban centers can be formed by relying on any, or more probably some mix, of these approaches. It is important to note, however, that there are other *nonvariable cost determinants* set by physical conditions of the city as a whole (climate, topography, soil conditions, availability of water) that may limit the potential impact of such strategies or have a strong influence on their composition. In an area where water is particularly scarce, for example, the strategy should focus more on reducing water supply costs than in one where it is not. Variations in such "givens" between cities can be dramatic--they

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6 Most important, steps to eliminate wasteful practices in, and generally improve the effectiveness of, the institutions responsible for designing, implementing, and operating infrastructure systems.

are one of the most important factors explaining why it is so difficult to establish meaningful infrastructure cost norms across regions or countries.

Cities are located where they are because a mix of circumstances created some economic advantage for clustering activities at those locations at the time they were founded (see discussion in Isard, 1965). Physical constraints noted above may have existed, but did not have much effect as long as the settlement remained small. But when it grows bigger, per-unit expansion costs may skyrocket. In these circumstances, it may well make sense for a nation to try to shift more of its urban growth to other centers, at least to those with sufficient size and economic strength to absorb it efficiently (see Hamer, 1985). Yet very large urban areas do continue to grow even where physical constraints are severe. The fact that Mexico City and Bangkok continue to expand is a testimony to the power of agglomeration economies in large centers.

FRAMEWORK FOR EVALUATING ALTERNATIVES

Economists generally accept the same rules for comparing costs of development alternatives. This is not the place to describe them in detail,[7] but they should be mentioned since failure to follow them can lead to major errors in system design choices.

Full Life-Cycle Costs. Local decision makers should review the full life-cycle costs of all infrastructure options being considered. This means including *operating and maintenance (O&M) costs over the expected useful life of each system, as well as capital costs* (cheaper technical solutions that significantly reduce initial capital costs may well be inefficient because they mandate the need for much higher O&M costs over the long term) It also means including (and separately identifying) *costs that will have to born by all classes of providers* (solutions that cut costs for the agency that develops and operates a public system may well require disproportionate increases in outlays by businesses and households). Finally, it is important to include (and separately identify) *costs for all system components*. Most infrastructure elements have at least two basic components: (1) "headworks" (including, for example, water production and treatment facilities, sewage treatment plants, transportation terminals, and power stations), and (2) collection/distribution networks. The latter are sometimes subdivided between main (or "trunk") networks that link the headworks to neighborhoods, and neighborhood systems that link individual houses and businesses to the trunk lines. Estimating costs for such components separately is useful because any given cost reduction approach may have a different impact on different components. For example, scale economies seem to affect costs of the headworks of water supply systems much more than the distribution components while density variations can have important effects on the costs of distribution systems but not those of headworks.

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7 An overall explanation of the principles and how to apply them is provided by Galambos and Shreiber (1978), and Kalbermatten et al. (1982b) offer a good review of their application in evaluating sanitation alternatives. Both are written to be readable by non-economists.

Average Incremental Costs, Discounted to Reflect the Time Value of Money. Since a dollar spent today is worth more than a dollar scheduled to be spent several years from now, all costs after the first year need to be appropriately discounted to develop useful estimates. Having done that, a good measure for comparison is the *average incremental cost:* the present value of the year by year streams of capital and O&M costs, divided by the present value of the year by year incremental additions to the population served or units of service produced. This measure will appropriately discount the value of alternatives which, although they might be theoretically "more efficient" in the long term, require a long development period and waste resources during that period as less than full service is being provided. It also gives no weight to "sunk costs"--expenditures made on a system in the past which, in fact, are not relevant when considering alternative ways to spend money in the future.

Economic Costs As Well As Financial Costs. Financial costs are those that infrastructure agencies, households, and business actually have to pay out to purchase something (the amounts that will appear in their checkbooks). But those outlays do not always reflect true resource costs to the national economy considering its particular resource endowment. Economic costs are adjusted (establishing "shadow prices") to represent the latter and they should be used as the basis for choosing between alternatives. Four types of adjustments are typically necessary: (1) using the real opportunity cost of labor inputs (which may be close to zero where there is substantial unemployment) instead of the wages that will have to be paid out, since the latter may be influenced by "minimum wage" or other legislation; (2) pricing imported items at what the national currency would be worth in a freely trading international market rather than the official exchange rate (this can make a substantial difference when the nation's currency is overvalued); (3) using the true opportunity cost of capital rather than current interest rates (since the latter may be distorted by regulations or subsidies); (4) and estimating the price a free market would pay for land, water, power, and other goods and services where government involvement often leads to distortions.

The next few sections review hypotheses and evidence concerning the application of the the first two cost reduction strategies (reducing service levels and altering technology choices) to three infrastructure/service systems which together generally account for the majority of all urban infrastructure costs: (1) water supply; (2) sanitation (human waste disposal); and (3) roads. The possible impacts of the third strategy (density adjustments) are considered across these and other elements in a later section.

Cost data now available are most often not in the form required for a full and proper evaluation as outlined above. For that reason, it is important to exercise caution in interpreting the partial data that are presented below. In these sections we refer most often to data from the NUDS/PADCO study for Indonesia (1985a and 1985b)--not because the cost relationships found there are broadly applicable, but because this work is probably the most thoroughly researched nation-wide multi-sector study completed to date and has advantages both with respect to level of detail and internal consistency across sectors.

WATER SUPPLY

Among all urban services, water is the only one essential to human life, thus it warrants a certain primacy in infrastructure design. Urban water utilities obtain their supplies primarily by diverting water from surface flows (rivers and streams) and/or pumping it from below-ground aquifers.[8] It was noted earlier that in smaller settlements and parts of many large cities in Indonesia, ground water conditions are such that a fully decentralized technology (water wells for individual houses and businesses) is cost effective. This is a rare condition, however. Normally, urban water supplies require central production facilities with distribution via a piped system.

Production, Treatment, and Storage

The Importance of Headworks Costs. The headworks of water supply systems include: (1) production facilities (diversion structures and/or wells and pumps); (2) aqueducts or other means to convey water from the production site to the city (where required); (3) treatment plants, as needed to provide adequate water quality; and (4) storage tanks and/or reservoirs.

Assuming basically sensible engineering, the primary determinants of the costs of these facilities are the non-variable physical circumstances of the city. Water production will clearly be much more expensive in a city where local aquifers are insufficient and the nearest river is some distance away than in one with easier access to adequate supplies regardless of the technology applied. Topography also makes a difference. If the primary water source is at an elevation above the city, distribution to the city and to customers within it can operate by gravity flow. If the source is at a lower elevation, expensive pumping equipment may be required.

Linn (1982) points out that production and aqueduct costs are likely to increase over time as a city grows. Not surprisingly, water providers draw first on the supplies that are cheapest to access. With growth, they have to move on to other sources and that implies higher costs. A large share of the metropolitan Los Angeles water supply, for example, is now piped from watersheds in northern California, over 600 miles away. Incremental water supply for Lima, Peru and other cities has to be transported much greater distances than initial supplies. Increasing urban concentration can affect system costs in other ways. One example is by increasing pollution levels in water sources thus mandating higher outlays for treatment. Another is when the city's growth reaches a point that underground reserves are being used faster than they are naturally replenished. In coastal cities, this can lead to seawater incursion in the aquifer (as is occurring in Jakarta and Bangkok).

Varying Service Levels. When water production is expensive, an obvious approach to cutting costs is to reduce service levels, or to increase prices to consumers so that they voluntarily reduce consumption. Since all households require water to survive, policies that

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8 Capturing rainwater or desalinizing seawater are, of course, other options, but neither has represented a quantitatively significant source for urban systems to date.

withhold service for some of them altogether (except those who live near streams or where groundwater is easily accessible at low cost) are difficult to support. But there are options with respect to varying the quantity of water households receive.

How much water is essential? There are no hard and fast requirements, but there are some useful rules of thumb. The World Bank (Kalbermatten et al., 1982b) judges that 20-25 liters per capita per day (LCD) is the minimum necessary to sustain life. In Indonesia, 30 LCD is regarded as sufficient to provide water for drinking, cooking, and dishwashing, but not for bathing, washing clothes, or other uses (this figure is used as the standard for water delivery by communal standpipes--NUDS/PADCO, 1985). This level would make an unreasonably low urban average, however, since households that can afford more are likely to want to buy more. The Indonesia target for individual house connections in moderate income areas is 60 LCD, but provision to families in higher income areas in larger cities there reaches 225-240 LCD. For residential use, Indonesia's urban development strategy (NUDS/PADCO, 1985b) targets averages for the year 2000 ranging from 71 LCD in cities with less than 50,000 population to 144 in those with over one million.

Then there are the needs of businesses. NUDS/PADCO (1985a) found that in Indonesia, nonresidential use accelerates rapidly with city size. Their strategy's targets for businesses range from 15 percent of the residential targets in the smallest cities to 90 percent in the million-plus category. This brings total targeted consumption in the latter group up to 274 LCD. Boland (1984) found that average total consumption for 99 U.S. systems serving areas with over 100,000 population was 668 LCD (the full range was from 326 to 1,867). Thus there is considerable latitude between minimum requirements and what water suppliers find it sensible to provide given the economic circumstances of the area.

Finally, it is necessary to consider unaccounted-for-water (UFW, water produced but subsequently lost to the system due to leakage, pilferage, etc.). The Indonesia year 2000 target for UFW is 15 percent of total consumption for all cities (adding this to consumption implies a total production target in the largest cities of 315 LCD). This is an ambitious target, comparable to performance found in developed countries. Boland's study found an average UFW of 12 percent for the 99 U.S. systems (range from zero to 55 percent). Most developing countries have much larger loss rates. For example, Garn (198[illegible]) found that cities participating in World Bank water supply projects had average UFW rates in excess of 40 percent, and that these proved very difficult to reduce.

Taking Advantage of Economies of Scale. It is generally recognized that scale economies have an important effect on the efficiency of public water system headworks. Estimates for small systems in Indonesia (Table 1) indicate that total capital costs for headworks per cubic meter of water produced per day (M^3D), drop from Rp. 437,200 for a system serving 5,300 people to about one third of that amount for one serving 60,300 people. And sizeable reductions are evidenced in virtually all of the major subcomponents (e.g., production, treatment, and storage). NUDS/PADCO (1985a) indicates that per-unit costs continue to decline in yet larger systems (though not as rapidly). Scale economies also appear in O&M. In a 1984 survey of 36 water companies in Brazil, Yepes (1990) found that

Table 1

WATER PROVISION AND CAPITAL COSTS
(Small Systems, Indonesia)

Plant Capacity (l/s)	5	10	20	40	60
STANDPIPES					
Population served	1064	2129	4021	8042	12063
No. standpipes	21	43	80	161	241
Pop. per standpipe	50.7	49.5	50.3	50.0	50.1
Consumption (m3/d)	32	64	121	241	362
Liters/capita/day	30.0	30.0	30.0	30.0	30.0
HOUSE CONNECTIONS					
Population served	4258	8515	16084	32168	48252
No. connections	532	1064	2011	4021	6032
Pop. per connect.	8.0	8.0	8.0	8.0	8.0
Consumption (m3/d)	255	511	965	1930	2895
Liters/capita/day	60.0	60.0	60.0	60.0	60.0
PRODUCTION (m3/d)					
Tot. resid. consump.	287	575	1086	2171	3257
Nonresid. consump.	43	86	163	326	488
(Pct. of resid.)	15.0	15.0	15.0	15.0	15.0
Losses	58	117	220	441	661
(Pct.res.+nonres.)	17.7	17.7	17.7	17.7	17.7
Total	388	778	1469	2938	4406
CAPITAL COST (Rp. 1984 000 per m3/d)					
Production					
Intake	40.2	20.0	14.2	9.1	7.4
Power	74.4	37.1	19.7	9.8	6.6
Mech./elect	105.9	61.8	61.0	42.5	33.3
Ground reservoir	1.7	16.8	33.5	23.6	19.0
Buildings	76.9	36.3	67.0	38.0	27.9
Treatment	133.0	101.2	101.0	64.4	49.7
Subtotal	437.2	273.3	296.4	187.4	144.0
Transmiss.distrib.	142.9	137.3	108.1	88.9	84.5
Retic., connect.	210.8	200.4	166.5	155.0	152.4
Total	791.0	611.0	570.9	431.3	380.9
Proj.prep.& other	246.4	133.3	80.5	45.4	32.6
Grand total	1037.4	744.3	651.4	476.7	413.5
PERCENT OF CAPITAL COSTS					
Production	55.3	44.7	51.9	43.4	37.8
Transmiss.distrib.	18.1	22.5	18.9	20.6	22.2
Reticul.,connect.	26.7	32.8	29.2	35.9	40.0
Total	100.0	100.0	100.0	100.0	100.0

SOURCE: NUDS/PADCO, 1985a

companies with fewer than 10,000 water connections had an average of 10.8 staff per 1,000 connections. The staffing ratio then decreased regularly as system size increased, reaching an average of 6.8 for companies servicing more than one million connections. (Note that these are economies of scale for public systems; depending upon local circumstances, individual on-site water supply may be more or less expensive than public systems.)

Water Distribution Systems

Potential Impacts of Different Strategies. The distribution side is less affected by the city's physical circumstances (water availability, land form, etc.) than the production side (although some types of topography require more pumping in the distribution network than others). Scale does play a role (see Table 1), although its impact is much less significant in distribution than in production. Assuming a policy to provide some water to all households, varying the quantity of water provided does not have much influence on the distribution system. Pipes have to be there regardless of the amount of water flowing through them, pipe costs do not vary greatly with size within a reasonable range, and much of the network capital cost is required just for digging the trenches.

More significant variations in distribution costs can be created by options that reduce pipe lengths and connection costs per household served. One option for doing so is to increase urban densities (to be discussed later in this chapter). Others involve changing the mix between individual house connections and less convenient forms of delivery.

House Connections vs. Standpipes and Trucked Water. Capital costs can be reduced by piping water to intermediate distribution points (rather than all the way to individual dwellings). This yields not only shorter pipe lengths, but fewer meters and terminal connections. Bulk water can then be trucked to neighborhoods or, alternatively, the distribution system can be extended into the neighborhood to a limited number of communal standpipes (rather than being connected to many more individual houses). With the trucking option, of course, the supplier has to purchase and operate the trucks. While there are few analyses that focus on this option, those that do suggest it is not cost-effective (see Whittington, Lauria, Okun, and Mu, 1989). In practice, it tends to be used in urban areas only when other options are not yet available. The private sector typically fills the gap in public water supply by vending from trucks.

Communal standpipes, however, are used much more extensively as part of a public water distribution strategy. Berry and Sierra (1978) found that the capital cost (distribution system only) for a system relying on standpipes for all residential service (in a suburb of metropolitan Jakarta) would be 26 percent less than one providing service directly to each dwelling. Their analysis indicated that the most effective design would provide one standpipe for every 50 people, which would permit an average standpipe-to-home distance of about 200 meters. Studies indicated, however, that low and moderate income families were willing to pay a considerably higher portion of their incomes for water if it was provided directly to their lot rather than to a standpipe. The difference in cost recovery potential was judged sufficient to largely outweigh standpipes' capital cost advantage. Maintenance costs were also much

higher with standpipes. The government's national strategy finally targeted to serve 80 percent of urban population growth via house connections and the remaining 20 percent via standpipes (NUDS/PADCO 1985b).[9]

SANITATION (HUMAN WASTE DISPOSAL)

Of all infrastructure elements, sanitation offers by far the broadest range of technical options (and costs). There are three basic types: (1) piped sewer systems that deliver water borne sewage to central plants for treatment and disposal; (2) on-site solutions that may involve some treatment and storage but ultimately allow residual wastes to filer into the soil; and (3) cartage systems that entail interim storage on site with later removal and transport to a disposal facility (with or without treatment). Through the late 1970s, local officials generally considered piped systems to be the only acceptable alternative from the health standpoint. Studies since then have shown, however, that if properly developed, on-site and cartage approaches can meet basic health requirements, though they still may not be regarded as comparable with respect to aesthetics or convenience.

System Features and Cost Determinants

Cost determinants for ***piped sewerage systems*** are in many ways similar to those for water systems, in reverse order. Costs of the collection network can be reduced by promoting higher urban densities and by providing communal (rather than individual household) toilets (although the latter generally receive even lower consumer acceptance than communal standpipes). Collection system costs of course go up where the topography requires substantial pumping. Headworks (sewage treatment plants) account for a large share of total system costs and, like the headworks of water systems, their costs appear to be strongly influenced by economies of scale.

There are a variety of different ***on-site options*** (see Kalbermatten, et al., 1982b, for complete descriptions). The cheapest are simple pit latrines that either do not use water for flushing at all or (as in the case of Pour Flush toilets) use very little. As water use goes up, so do the requirements for safe storage and treatment since liquid wastes most threaten ground water quality. And with more elaborate structures and on-site treatment (moving up from simple pit latrines to ventilated improved pit latrines, aquaprivies and then full septic tanks) costs increase appreciably. Soil conditions are extremely important to on-site approaches. Where the soil is relatively impervious, or alternatively permits effluent to reach the water

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9. Whittington et al. (1990) also conclude that the best solution for low income settlements is a mix of house connections and standpipes, but they argue that the manner in which standpipe water is sold can have a very strong impact on cost recovery. Their studies in Nigeria indicate that selling standpipe water from kiosks at a per-bucket rate is considerably more effective than charging local users a fixed monthly cost. They also suggest that allowing some families with house connections to set up kiosks and sell water to others can further enhance the cost-effectiveness as well as the convenience of the system.

table quickly without cleansing, such approaches imply substantial health hazards and are usually infeasible.

There is also a range of possible ***cartage options*** and these normally require special designs for storage within the latrine. At once extreme, (in denser portions of Shanghai, for example) people visit every house each morning to collect night soil in hand held buckets and then carry it to an intermediate disposal point. At the other, (also found in many cities in the orient) vacuum trucks collect much larger volumes of waste from a larger number of units before hauling it to treatment facilities.

Cost Variations and Strategies

This is the one infrastructure element for which a comprehensive costs analysis has been completed, covering international experience and measuring costs consistent with the framework for proper comparisons noted earlier. Kalbermatten et al. (1982a and 1982b) examined the costs of a variety of basic sanitation options operating in 9 different countries. On average, there were 4.2 observations per option.

The results for 10 options are presented in Tables 2 and 3. Amounts reported are average incremental Total Annual Costs per Household (TACH) covering capital as well as O&M costs of all components and all providers (public and private). The most pertinent observations are:

1. The options exhibit a tremendous range in costs. The TACH for the highest cost option (piped sewerage) is 14 times that of the lowest cost option (on-site pit latrine).

2. Fortunately, the circumstances do not force a choice between extremes. There are a number of medium-cost/medium quality options available to communities that can afford them.

3. On-site options are not always the cheapest. The cost of septic tanks developed at high standards is just 8 percent below that of full piped sewer systems.

4. O&M costs are never dominant, but almost always significant (ranging between 30 and 40 percent in most cases).

A low-income neighborhood will probably be forced to start at the low end of the scale, but designs should facilitate improving service quality over time as household incomes increase. The Kalbermatten study (1982b) presents a prototype upgrading program for a neighborhood in an East African city that initially could only afford water via communal standpipes and ventilated improved pit latrines for sanitation (considered adequate from a health standpoint although clearly less than desirable over the longer term). After ten years, the water supply is upgraded from standpipes to yard hydrants and the dry latrines are replaced by pour flush toilets with new adjacent soakage pits. After the 20th year, the water service is converted to house connections so there is considerable sullage water to be disposed of. New

Table 2

Average Annual On-Site, Collection, and Treatment Costs per Household (1978 U.S. dollars)

Technology	Mean TACH	On-Site	Collection	Treatment	Percentage of Total On-Site	Collection	Treatment
Low Cost							
Pit Privy	28.5	28.5	---	---	100	---	---
Communal Toilet	34.0	34.0	---	---	100	---	---
Vacuum-truck Cartage	37.5	16.8	14.0	6.6	45	37	18
Composting Toilet	55.0	47.0	---	8.0	85	---	15
Bucket Cartage[a]	64.9	32.9	26.0	6.0	51	40	9
Medium Cost							
Sewered Aquaprivy[a]	159.2	89.8	39.2	30.2	56	25	19
Aquaprivy	168.0	168.0	---	---	100	---	---
Japanese Vacuum-Truck Cartage	187.7	128.0	34.0	26.0	68	18	14
High Cost							
Septic Tank	369.2	332.3	25.6	11.3	90	7	3
Sewerage	400.3	201.6	82.8	115.9	50	21	29

---Negligible.

a. Per capita costs were used and scaled up by the cross-country average of six persons per household to account for large differences in the number of users.

Table 3

Average Annual Capital and O&M Cost per Household for Sanitation Technologies (1978 U.S. Dollars)

Technology	Mean TACH	Capital Cost	O & M Cost	Percentage of Total Capital	O & M
Low Cost					
Pit Privy	28.5	28.4	0.1	100	---
Communal Toilet	34.0	24.2	9.8	71	29
Vacuum-truck Cartage	37.5	18.1	19.3	48	52
Composting Toilet	55.0	50.9	4.8	92	8
Bucket Cartage[a]	64.9	36.9	28.0	57	43
Medium Cost					
Sewered Aquaprivy[a]	159.2	124.6	34.6	78	22
Aquaprivy	168.0	161.7	6.3	96	4
Japanese Vacuum-Truck Cartage	187.7	127.7	60.0	68	32
High Cost					
Septic Tank	369.2	227.3	141.9	62	38
Sewerage	400.3	269.9	130.4	67	33

---Negligible.

a. Per capita costs were used and scaled up by the cross-country average of six persons per household to account for large differences in the number of users.

(lined) pits are installed, overflow pipes connect the pits to a new small-bore sewage system, and treatment facilities are provided. At this point, cistern-flush toilets can be used. The present value of the cost stream for all of this over a 30 year period (capital plus O&M costs, per household) is still only 12 percent of the comparable figure for a full piped sewage system installed at the outset.

Similarly, in planning a city-wide program, there is no need to select only one option. The Indonesia project (NUDS/PADCO, 1985b) planned a number of incremental improvement alternatives similar to the one described above. Initial installations depended on gross population densities since the higher the density the higher the probability of ground water pollution due to inadequate sanitation. Where soil and ground water conditions were good, the project proposed no public systems at densities lower than 120 persons per hectare (ha.) (total area of smaller towns and fringes of larger ones). Above 275 persons per ha., full piped systems would be provided at the start. Options in between moved up from low-cost septic tanks to mixes of tanks with small bore overflow networks and tanks with vacuum cartage. Where possible, waste stabilization ponds were used rather than conventional treatment plants. Although they require more land, waste stabilization ponds are generally cheaper because their O&M costs are extremely low (see World Bank, 1983).

The capital cost savings from less expensive technologies have been formally incorporated into several countries' capital plans. For example, the Government of India, in its Sixth Development Plan (1980-85), established that cities with populations below 100,000 would receive low-cost, pour-flush latrines, rather than more expensive solutions.

URBAN ROADS

Urban road systems present a less complex design challenge than either the water supply or sanitation systems. There are fewer technical options. There are no headworks. There is simply a collection/distribution network whose capital costs are determined primarily by its physical dimensions and the quality of materials used in its construction. O&M costs are more important here, however, as vehicular traffic implies considerably more wear and tear on surfaces than liquids flowing through pipes.

System Dimensions

Areas devoted to public road systems vary considerably over different city sizes and national settings. Land use data for Indian and U.S. cities in Table 6 (explained more completely in the next section) offer useful comparisons. Indian cities (as of 1971) provided an average of 1.2 hectares (ha.) of road right of way per thousand inhabitants. The average for the largest cities (above one million population) was 0.6 ha. per 1,000 population. Land in road use increased on a fairly regular basis thereafter as city size decreased, reaching 2.1 ha. for cities in the 20,000-50,000 population range. Road areas represented 13 percent of total developed urban land on average. Measured as a percentage of total developed area, there was no systematic variation with city size.

Road areas in U.S. cities (as of the early 1960s) exhibit the same types of patterns, but the numbers are much larger. Road ha. per thousand population increased from 4.2 in cities with over one million up to 7.6 in those in the 100,000-500,000 range (average of 5.6 ha., almost five times the India average). Again, roads as a share of total city area remain fairly constant over the size distribution (averaging 26 percent, twice the India average).

Differences in the extent of motorization probably account for much of this variation. Most Indian urban dwellers do not have cars--they live in large block areas and have to walk some distance from their home on a footpath before reaching the public street. In the U.S., even in the early 1960s, virtually all individual houses fronted directly on a public street.

NUDS/PADCO (1985b) proposals (Table 4) are consistent with this pattern, with provision per capita increasing as city size declines and with absolute levels (range of 7.0 to 1.1 ha. per thousand population) somewhat larger than those in India to account for increasing motorization, but still considerably below those in the U.S. In all cities there is a hierarchy of road types ranging from broad arterials to narrower streets within residential neighborhoods. The average road ROW is wider in larger cities to address demands due to higher auto densities. Capital costs are projected to be higher in larger cities as well, partly because of this, but also because higher construction standards and more traffic management equipment are required there. As shown on the table, capital cost per square meter of right of way in cities with 20,000 inhabitants or less, are about 20 percent of the averages for cities with over one million.

Construction Standards and O&M Costs

Road surfaces are built up from coarser aggregates at the base to finer grained materials and finally capped with a sealing material. Generally, the overall thickness of these materials determines the useful life of the road. Roads have to be thicker where average daily traffic (ADT) is higher, otherwise they will deteriorate more rapidly and require more frequent repairs.

Reno and Cohen (1990) have analyzed the cost tradeoffs in these relationships for major U.S. highways, but the principles are generally applicable. Engineering standards indicate that at an ADT of 120,000 vehicles, a granular base equivalent thickness of 20.2 inches will support a pavement life of five years. Increasing the thickness to 30.2 inches will increase pavement life to 25 years. Differences in capital costs are roughly proportional to differences in thickness. The 25-year pavement cost is 1.5 times that of the five year pavement. But the discounted operating, maintenance, and rehabilitation costs of keeping the five year pavement usable over a 25 year period are 2.3 times the initial capital cost and 5.2 times the full O&M costs of keeping up the surface initially built for a 25 year life. The full annualized cost to the highway agency for the thicker 25 year pavement is $40,000 per mile, much below the comparable $70,000 per mile for the five year surface (Figure 1).

In addition, there are differences in costs to those who drive on the highway. User costs include time lost due to congestion or other delays, additional vehicle repair costs from driving

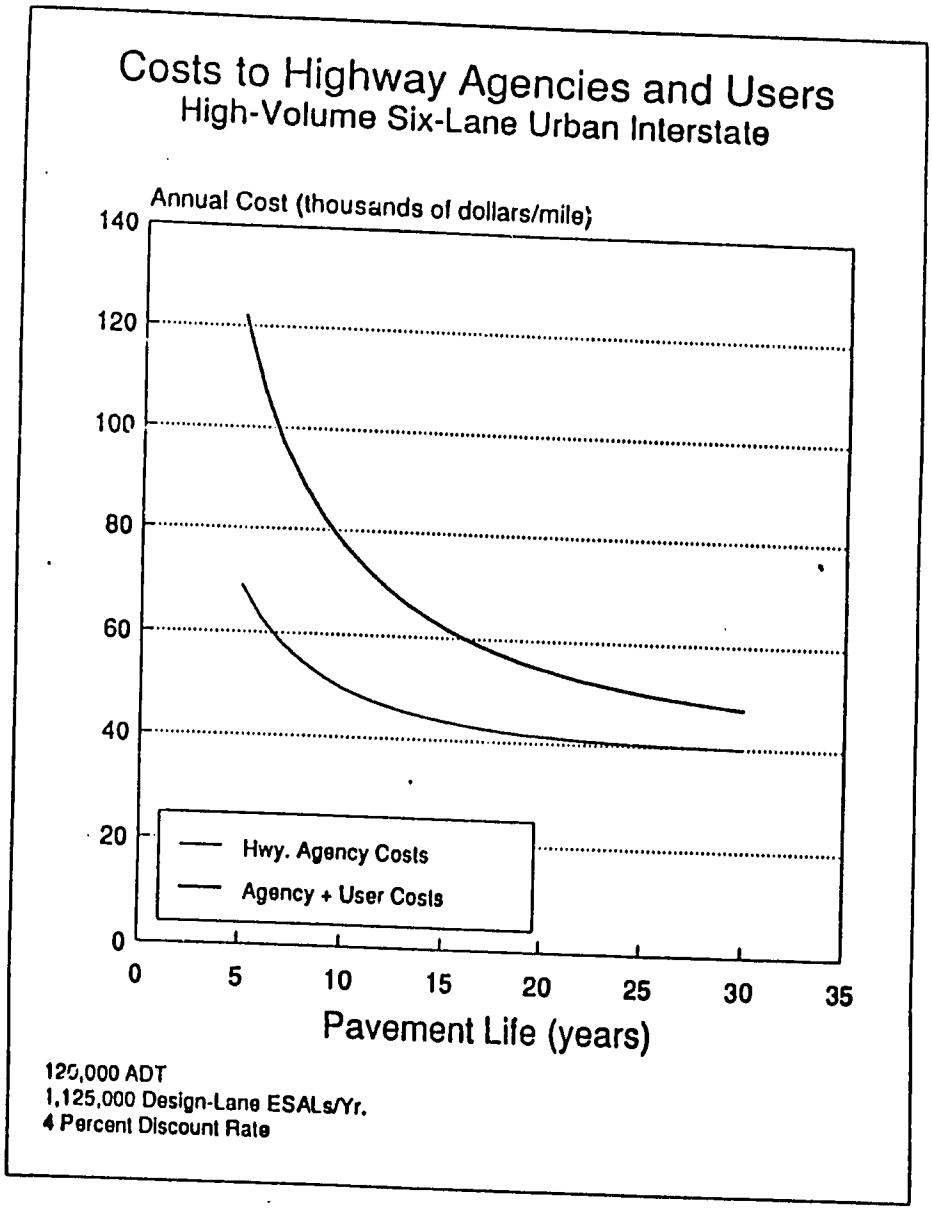
Table 4

INDONESIA STUDY ROAD DIMENSIONS
AND CAPITAL COSTS

City Size (Pop.000)	Length Rd.(Km)	Roads % Area	Rd.Ha./ 1000 Pop	Ave.ROW (M.)	Cap.Cost (Rp.Mil)	Rp.000/ Sq. M.
10	102	17.5	7.0	6.9	1054	1.50
20	157	12.5	5.0	6.4	1482	1.49
50	210	11.5	2.6	6.2	2886	2.22
100	266	15.5	2.3	8.5	8296	3.68
250	436	15.2	1.5	8.4	15076	4.10
500	720	14.8	1.2	8.2	28005	4.72
1027	1842	18.4	1.8	10.0	137691	7.49
5917	5742	18.3	1.1	11.3	478593	7.37

SOURCE: NUDS/PADCO, 1985b

Figure 1


Costs to Highway Agencies and Users
High-Volume Six-Lane Urban Interstate
Annual Cost (thousands of dollars/mile)
140
120
100
80
60
40
20
0
0
5
10
15
20
25
30
35
Pavement Life (years)
Hwy. Agency Costs
Agency + User Costs
120,000 ADT
1,125,000 Design-Lane ESALs/Yr.
4 Percent Discount Rate

over deteriorated surfaces, and the losses associated with accidents. In the U.S., considerable research has been done to value such costs. As applied in the above example, the user costs associated with the five year pavement are about five times those for the longer-life surface, principally because of lost time and risks associated with more frequent highway rehabilitation activity. The full annualized cost (agency costs plus user costs) for the 25 year surface is only $50,000 per mile, compared to $120,000 for the five year surface.

These relationships cannot be expected to continue to hold as pavement life is extended ever farther into the future. Due to opportunity costs, technical limitations, and other factors, at some point the cost curve will turn up again. Also, given different settings of determinants (e.g., relationship between unit costs of labor and materials), it should not be assumed that the the precise curve shown in Figure 1 will apply in other national settings. The main lessons from the review above are that this type of analysis is vital in road planning for all cities, and more basically, it is quite dangerous to make road design decisions based on comparisons of agency capital costs alone. It often will be cost e3ffective to incur higher initial capital costs by building to standards that reduce the need for future repairs and maintenance.

URBAN DENSITY

At several points in the preceding sections we have noted that increasing urban density (creating more compact urban land use) reduces the required lengths of distribution and collection networks and thus should have an important impact on their costs. There are limits to this approach, of course. At some point, densities become too high to support human habitation given today's structural alternatives. Just below that level, high-rise (and normally very high cost) structures are required. The most cost effective options are usually found farther down the scale. But what is a reasonable range?

Density and Land Use Ranges

There are no uniformly accepted limits in this regard and there is a wide range of actual experience. One noted planner (Blumenthal, 1965) suggested that the acceptable average gross density (persons per unit of developed urban land) for a city as a whole can range as high as 222 persons per ha. Some, but very few, exceed that level (see Table 5). The United Nations reports that the average for cities in developing countries is 121. In the early 1960s, the average for 48 large U.S. cities was 54.

There are very few studies reporting on the structure of urban land use that contain data for a sizeable numbers of cities using consistent definitions. The results of two are summarized on Table 6. The average density for 292 Indian in 1970 was 108 persons per ha., implying the availability of 9.3 ha. of urban land per thousand persons. Land availability is lowest in the largest city size category (6.3 ha. per thousand persons in cities over one million population) and increases as city size declines (up to 14.0 ha. for cities in the 20,000-50,000 range). U.S. cities provide considerably more developed land per capita in any given size range but, as in India, land availability increases fairly regularly as city size declines (ranging

Table 5

GROSS URBAN DENSITIES AND LAND USE

Persons per Ha.	Ha/1000 Persons	Cities or Standard, and Source
392.1	2.6	Calcutta 1962 (CMPO, 1965)
275.0	3.6	Requires piped sewerage (Kalbermatten, 1982b)
236.0	4.2	Cairo, 1980 (Kitay, 1985)
222.4	4.5	Blumenfeld (1965) top reas.range human settle.
161.3	6.2	Ave. India Cities 500,000 to 1 mill.(TCPO, 1983)
158.7	6.3	Ave. India Cities 1 mill.plus (TCPO, 1983)
149.7	6.7	Buenos Aires, 1980 (Kitay, 1985)
139.4	7.2	Rio de Janiero, 1980 (Kitay, 1985)
120.5	8.3	Ave. cities developing countries (UNCHS, 1986)
114.9	8.7	Ave. India Cities 100,000-500,000 (TCPO, 1983)
107.7	9.3	New York City (Niedercorn, 1963)
75.8	13.2	Ave. India Cities 50,000-100,000 (TCPO, 1983)
71.4	14.0	Ave. India Cities 20,000-50,000 (TCPO, 1983)
70.0	14.3	Bangkok, 1980 (Kitay, 1985)
65.0	15.4	Kinasha, 1980 (Kitay, 1985)
53.6	18.6	Ave. 48 U.S. Cities (Niedercorn, 1963)
51.1	19.6	Kingston, Jamaica (Kingsley, 1987)
40.2	24.9	Ave. U.S. Cities 500,000-1 million (Nied., 1963)
32.9	30.4	Ave. U.S. Cities 100,000-500,000 (Nied., 1963)
30.4	32.9	Los Angeles (Niedercorn, 1963)

Table 6

LAND USE IN INDIAN AND U.S. CITIES

	No. Cities	Total	Resi-dent.	Other Priv.	Roads	Other Public
DEVELOPED HECTARES PER 1,000 POPULATION						
Indian Cities						
1 million or more	3	6.3	2.4	0.6	0.6	2.7
500,000-1 million	6	6.2	2.3	1.2	0.7	2.0
100,000-500,000	86	8.7	4.0	0.7	1.1	2.9
50,000-100,000	72	13.2	5.8	1.4	1.5	4.5
20,000-50,000	125	14.0	5.3	2.1	2.1	4.5
Total or Average	292	9.3	3.9	1.1	1.2	3.2
U.S. Cities						
1 million or more	4	15.3	6.1	2.4	4.2	2.5
500,000-1 million	15	24.9	9.9	3.8	6.1	5.2
100,000-500,000	24	30.4	12.6	4.4	7.6	5.8
Total or Average	43	21.5	8.7	3.2	5.6	4.1
PERCENT OF TOTAL						
Indian Cities						
1 million or more	---	100.0	38.1	9.5	9.5	42.9
500,000-1 million	---	100.0	37.1	19.4	11.3	32.3
100,000-500,000	---	100.0	46.0	8.0	12.6	33.3
50,000-100,000	---	100.0	43.9	10.6	11.4	34.1
20,000-50,000	---	100.0	37.9	15.0	15.0	32.1
Total or Average	---	100.0	41.9	11.8	12.9	34.4
U.S. Cities						
1 million or more	---	100.0	40.0	15.6	27.8	16.6
500,000-1 million	---	100.0	39.7	15.1	24.5	20.7
100,000-500,000	---	100.0	41.3	14.5	25.0	19.2
Total or Average	---	100.0	40.3	15.1	25.8	18.8

SOURCE: Calculated from data in TCPO, 1983 (for India) and Niedercorn and Hearle, 1963 (for the U.S.)

from 15.3 ha. per thousand in the million-plus category, up to 30.4 ha. in the 100,000-500,000 range).

In all individual land use categories in both countries the relationship with city size appears the same--more developed land per capita as city size decreases. In fact, within each country the percentages for each land use show surprising little variation with size. In both India and the U.S., residential land accounts for about 40 percent of the total. Other private land (commercial, industrial) accounts for a somewhat larger share in the the U.S. (15 percent) than in India (12 percent). The biggest difference is that for roads (noted earlier in this chapter--26 percent in the U.S. vs 13 percent in India). Interestingly enough, India compensates with a higher share (34 percent) in other public land uses (parks, military cantonments, grounds of public buildings, etc.) than exists in the U.S. (18 percent).

Impacts of Density Reductions on Costs

To examine the effects density change can have on infrastructure costs, we assembled data from three studies: one for India (Bertaud et al., 1988); one for Jamaica by the Urban Institute and PADCO (based on data prepared by Brian Goldson, see Kingsley, Olsen, and Telgarsky, 1989); and the well known Costs of Sprawl analysis by the Real Estate Research Corporation in the U.S. (RERC, 1974). Each of these studies estimated the costs of different land development patterns using internally consistent methods in a manner that isolates the effects of density changes from the effects of other changes in standards.

Each study examined a number of different alternatives. Here we focus on only two per study: the design with the highest gross land requirement per housing unit (i.e., the lowest density), and that with the lowest land requirement. As shown on Table 7, design characteristics exhibit sharp contrast. The lowest density design (U.S.) uses 2,043 square meters of land per housing unit (including roads and other public and private space as well as residential land). The highest (India) uses only 70 square meters per unit. Land use per unit in that design is 77 percent below the high land requirement option from the India study. In the Jamaica study the gap between the high and low land requirement options is 66 percent. In the U.S. study it is 55 percent.

In all cases, the costs analyzed include those for collection-distribution systems and related on-site facilities only; i.e., costs for headworks and land purchase are not included. But all designs include piped water supply and sewerage systems with individual house connections. Results are reported on Table 8. The major conclusion is that density increases can make a tremendous difference in the costs of these systems. In all three studies, there was almost exactly a one for one reduction in cost with reductions in the per unit land requirement; e.g., using 50 percent less land per unit should imply a 50 percent reduction in overall cost.

Looking at individual components, there is a less consistent pattern. In both of the India designs, the sanitation collection system accounts for the largest share of all costs, where as roads is the dominant component in the other two studies. In the Jamaica analysis sanitation accounts for a larger share than water while in the U.S. study the reverse is true. In the U.S.

Table 7

DENSITIES IN COMPARATIVE COST STUDIES

	No.of Hs.Units	Hs.Units per Ha.	Sq.Meter per Unit	Percent Reduct.
India, 1983				
High land requirement	490	32.8	305	
Low land requirement	881	142.9	70	77.1%
Jamaica 1987				
High land requirement	26	15.9	630	
Low land requi t	76	46.5	215	65.9%
United States 1973				
High land requirement	10,000	4.9	2043	
Low land requirement	10,000	10.8	924	54.8%

SOURCES: India data from Bertaud et al (1988); Jamaica analysis from Kingsley, Olsen, and Telgarsky (1989) based on estimated by Brian Goldson; U.S. data from RERC, 1974.

Table 8

COST VARIATIONS WITH VARIATIONS IN LAND REQUIREMENTS

		Total	Water Suppl	Sani-tation	Storm Drain	Roads
COST PER HOUSING UNIT (as % of percapita GDP)						
India	High	375	94	165	*	116
India	Low	77	19	35	*	23
Jamaica	High	522	92	132	17	281
Jamaica	Low	194	34	64	10	87
U.S.	High	136	41	15	27	54
U.S.	Low	56	13	4	8	31
PERCENT OF TOTAL COSTS						
India	High	100	25	44	*	31
India	Low	100	25	46	*	29
Jamaica	High	100	18	25	3	54
Jamaica	Low	100	17	33	5	45
U.S.	High	100	30	11	20	40
U.S.	Low	100	23	8	15	54
REDUCTION COST/REDUCTION LAND						
India		1.03	1.03	1.02	*	1.04
Jamaica		0.95	0.96	0.78	0.65	1.05
U.S.		1.07	1.24	1.28	1.24	0.79

SOURCE: India data from Bertaud et al (1988); Jamaica analysis from Kingsley, Olsen, and Telgarsky (1989) based on estimates by Brian Goldson; U.S. data from RERC (1974).

GDP percapita: India, 1983 = 2,823.84 Rupees; Jamaica, 1987 = 6,645.67 Jamaican $; U.S., 1973 = 6,335.38 U.S. $.

* Storm drainage costs included in estimate for roads.

study the cost reduction yield per unit of density reduction is lowest for roads and much higher (1.24 to 1.28) for the other components. In the Jamaica study, roads have the highest yield in this regard. Such differences are not surprising given probable differences in design approaches and local costs, and they do not negate the overall conclusion. In all components, density increases have a substantial impact in reducing costs.

This strategy clearly has potential, but it must be recognized that residential densities are set most often by private developers in response to their sense of the preferences of potential home buyers. Whereas government engineers can directly decide what types and sizes of pipes will be used in a water supply system, narrow control over density is a much more difficult assignment for them--a point that will be discussed further later in this chapter.

In addition, a comparison of infrastructure costs alone tends to overstate the cost advantages of high density development. Land prices tend to be much higher in high density cities. Land acquisition costs therefore reduce the cost advantage of high density infrastructure. Finally, all of the cost comparisons refer to *newly developed* areas. They do not apply to existing development, where an intensification of density may require digging up and replacing existing infrastructure systems.

EFFECTS ACROSS INFRASTRUCTURE ELEMENTS

Looking across all elements, how much difference can these strategies make in reducing infrastructure costs. Unfortunately, no single study has been structured in a manner that allows us to isolate the independent effects of each. However, data from the Egypt and Indonesia studies (PADCO, 1982 and NUDS/PADCO, 1985b) give a sense of the cumulative effect (Table 9).

Option A for each country employed the highest overall standards, including piped sewerage for most new residents. The other options represent the combined effects of reductions in service levels, the use of less expensive technologies, and increases in urban densities. The Egypt options were not varied to reflect city size differences but, for Indonesia, options A and B represent the costs of adding population to large metropolitan areas, whereas options C and D represent high and low standard cases for small cities.

Clearly, the strategies do have a substantial effect. In Egypt the combined changes in service levels, technical options, and densities reduced capital costs from 52 percent to 59 percent of the high standards option. In Indonesia, these approaches reduced costs to 38 percent of the high standards option for larger cities. For smaller cities, capital required for the lower cost approach (Option D) is just 22 percent of that required of the high standards approach (Option C).

The table shows that all infrastructure elements are susceptible to savings through these techniques. Although the extent of the reductions vary, impressive reductions are evidenced in both countries in water supply, sanitation, solid waste disposal, and roads. The Egypt program

did not vary standards for electricity, but savings in this element in the Indonesia program indicate that it too can be made more efficient through these means.

These tables do not indicate that any one element is likely to be dominant in the overall infrastructure package (thus warranting a particular high priority in cost reduction). In 1977, the World Health Organization estimated that to achieve adequate standards in the developing world by the end 1980s, US$60 billion would have to be spent on water supply and an additional US$300-600 billion would be required for sewerage during that decade (Kalbermatten, 1982a). Since sewerage costs in that estimate amount to for five to 10 times the bill for water, this analysis made it appear that sanitation costs were dominant. However, this comparison is distorted in that existing sanitation deficits are much more severe than those for water. When considering only the costs to provide services to new urban populations, per capita sanitation costs are sometimes somewhat lower and sometimes somewhat higher than water costs, but never a large multiple of them.[10] It is true that solid waste disposal costs are consistently smaller than those for the other elements on Table 9, but the costs for water supply, sanitation, electricity, and roads are all large in all estimates where service is provided. Thus these elements all deserve scrutiny in cost reduction efforts.

CONCLUSIONS

Urban infrastructure systems can be built in a number of different ways and data presented in this chapter suggest that design choices can make a substantial difference in their costs. It is important to say again that it is possible to cut these costs too far--there is a point on the benefit/cost curve at which further cost reduction will disproportionately reduce benefits. Nonetheless, it does appear that in many systems in many countries there remains ample opportunity for further cost reduction before that point is reached.

Our review of possible cost reduction strategies offers no "quick-fixes": appropriate efficiency improvements cannot be obtained by looking at only one strategy or only one infrastructure element. Mixed packages are called for. But, some approaches are likely to have a higher payoff in some areas than others:

Choice of Service Levels. Reduction of service levels has the greatest potential effect on the capital and operating costs of water supply and electrical system production facilities, and the costs of solid waste collection and disposal. If the number of litres of water or kilowatt-hours to be produced, or the frequency of waste collection, is cut back substantially these costs will obviously decline (although there may be a partially offsetting effect due to loss of scale economies). Still, there is no point in cutting production of these services if there there are customers willing and able to pay for them.

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10. See the Egypt and Indonesia results in Table 9. Also, in the U.S. RERC study (1974) total capital costs for sewerage came to 54 percent of the full capital cost for water. On the other hand, in a World Bank analysis for urban areas in Brazil, per household sewerage costs came to 130 percent of those for water supply (Linn, 1982).

Table 9

CAPITAL COST ACROSS SYSTEM ELEMENTS

	Egypt (PADCO, 1981)				Indonesia (NUDS/PADCO, 1985)			
	A	B	C	D	A	B	C	D
COST PER CAPITA (as % of per capita GDP)								
Water	41.2	10.4	6.8	6.6	33.3	23.5	25.2	7.6
Sanitation	23.0	15.6	14.3	13.8	24.6	0.7	6.3	0.0
Solid Waste Disp.	12.3	2.6	0.0	2.6	0.5	0.5	0.3	0.1
Electricity	38.8	38.8	38.8	38.8	35.3	23.7	19.5	3.6
Roads	30.0	18.5	19.1	13.9	56.4	7.9	5.3	0.9
Total	145.3	85.9	79.1	75.7	150.1	56.3	56.6	12.3
PERCENT OF TOTAL								
Water	28.4	12.1	8.7	8.7	22.2	41.8	44.5	61.9
Sanitation	15.8	18.2	18.0	18.3	16.4	1.3	11.2	0.0
Solid Waste Disp.	8.4	3.0	0.0	3.4	0.3	0.9	0.5	1.1
Electricity	26.7	45.1	49.1	51.2	23.5	42.1	34.4	29.7
Roads	20.7	21.6	24.2	18.4	37.5	14.0	9.4	7.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PERCENT OF HIGHEST COST OPTION								
Water	100.0	25.2	16.6	16.0	100.0	70.7	75.7	22.8
Sanitation	100.0	67.9	61.9	60.1	100.0	2.9	25.7	0.0
Solid Waste Disp.	100.0	20.9	0.2	20.9	100.0	93.7	51.6	26.3
Electricity	100.0	100.0	100.2	100.0	100.0	67.1	55.3	10.3
Roads	100.0	61.7	63.7	46.4	100.0	13.9	9.4	1.6
Total	100.0	59.1	54.4	52.1	100.0	37.5	37.7	8.2

SOURCES: Derived from data in PADCO, 1982, and NUDS/PADCO, 1985b.

Lowering service levels is not likely to have much effect on the costs of water and power distribution systems. With other infrastructure elements (e.g., roads, sanitation) it is of course possible to withhold service from some households altogether, but once some service is provided it not possible (or at least not easy) to adjust the "quantity" of that service.

Choice of Technology. The range of choice among *technical options* is clearly broadest in sanitation. Here the cost differences between full piped sewerage and on-site and intermediate options are substantial and costs can be reduced without proportionate increases in health risks. The only other infrastructure element with a variety of technical options with widely varying costs is power generation (not analyzed in this chapter).

The potential for cost reduction by cutting the *physical standards* within a chosen option are fairly narrow for water supply, sewerage, and electric power. Because malfunctions in such systems are apparent quickly, engineers have incentives to provide standards high enough to prevent them, yet they also face counter pressures to keep costs low. Anecdotal evidence from a number of countries suggests that standards in these systems are generally somewhat higher than they need to be, and they should be reviewed. But it is doubtful that adjustments will yield major savings.

As we have seen, this approach can have more impact on road costs (where the effects of inadequate standards do not become apparent as soon and there is more temptation scrimp on quality initially). Here, long term savings will most often be gained by raising initial quality standards rather than by lowering them.

Choices about *scale*, have the greatest impacts on the costs of headworks of water, power, and sewerage systems (both capital and operating costs).

Choice of Spatial Pattern and Density. We have seen that for the distribution/collection components of virtually all infrastructure elements, ***higher densities*** can make an important contribution to cost reduction. Although we have not uncovered any properly controlled analyses of the effects of *extending growth in to "easy" vs. "hard" to serve locations, or reducing sprawl* in any locations, logic suggests that fairly important cost savings should be at least theoretically possible through these strategies as well.

As to density, public policies in many countries work against possible cost savings as regulations require minimum lot sizes and road and public space dimensions much larger than they need to be to create a liveable and pleasant urban environment.[11] If more reasonable standards were adopted, public tastes might still favor densities that are lower than is really

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11. The purpose of the studies summarized in Table 8 was to demonstrate this conclusion (Bertaud et al., 1988; Kingsley, Olsen and Telgarsky, 1989, RERC, 1974). Other analyses of the issue are found in NAHB, 1985, and World Bank, 1989. In the U.S., there is much public concern at present about a housing "affordability crisis" as rents and home prices increased much more rapidly than incomes during the 1980s. At least one researcher believes that local density controls are the most important cause of this problem (Downs, 1990).

necessary. Where this is the case, publicity campaigns about the advantages of attractive higher-density-low-rise neighborhood designs can have an influence.

On the other hand, public policy statements most often oppose sprawl and the extension of the urban fringe into zones that imply higher infrastructure costs. The problem here is that local governments have not often had the capacity to implement these intentions. Regulatory approaches have not proven effective in this regard (see Courtney, 1978; World Bank, 1988, Kingsley, 1989a). Careful planning for the strategic placement of trunk infrastructure, along with strong information program for private developers and consumers may offer a more hopeful direction for policy.

REFERENCES

Bertaud, Alain, Marie-Agnes Bertaud, and James O. Wright, Jr. 1988. "Efficiency in Land Use and Infrastructure Design: An Application of the Bertaud Model," Discussion Paper, Washington, D.C.: World Bank, May.

Berry, Brian J.L., and Katherine Sierra. 1978. *Public Works Investment Strategy in a Developing Country: Urban Water Supply in Indonesia.* Research Report R78-3. Cambridge, Mass.: Department of City and Regional Planning, Harvard University.

Boland, John J. 1983. *Water/Wastewater Pricing and Financial Practices in the United States.* Technical Report 1, MMI 19-83. Washington, D.C.: MetaMetrics, Inc.

CMPO (Calcutta Metropolitan Planning Organization). *Basic Development Plan for Metropolitan Calcutta.* Calcutta: CMPO, Government of West Bengal and Ford Foundation Advisory Planning Group.

Campbell, Tim. 1989. "Urban Development in the Third World: Environmental Dilemmas and the Urban Poor." *Environment and the Poor: Development Strategies for a Common Agenda,* Jeffrey H. Leonard, ed. *U.S.-Third World Policy Perspectives,* No. 11, Overseas Development Council. New Brunswick: Transaction Books.

Cohen, Michael A. 1983. "The Challenge of Replicability: Toward a New Paradigm for Urban Shelter in Developing Countries," in *Regional Development Dialogue.* Spring.

Construction Resource and Development Centre. 1987. *Analysis of the Costs of Alternative Development Standards.* Report of the USAID Sponsored Town Planning Review Project, Kingston.

Courtney, John M. 1978. "Urban Land Use Regulation," in Harold B. Dunkerly, ed., *Urban Land Policy Issues and Opportunities,* World Bank Staff Working Paper No. 283, Washington D.C.: The World Bank, May.

Dowall, David E. 1987. *Bangkok Land and Housing Market Study. Technical Report 1.* Bangkok Land Management Study. Washington, D.C.: PADCO.

Downs, Anthony. 1990. *Some Preliminary Thoughts for the Commission on Regulatory Barriers to Affordable Housing.* Washington D.C.: The Brookings Institution.

Gakenheimer, Ralph and Carlos Brando. 1988. "Infrastructure Standards," in Lloyd Rodwin, ed., *Shelter, Settlement, and Development.* Boston, Mass.: Allen and Unwin.

Galambos, Eva C., and Arthur F. Schreiber. 1978. *Economic Analysis for Local Government.* Washington D.C.: National League of Cities.

Garn, Harvey A. 1984. *The National Urban Policy Study for Egypt: An Approach to National Urban Settlement and Investment Strategies.* Washington D.C.: The World Bank. Mimeographed material.

Government of India. 1988. *National Housing Policy,* Ministry of Urban Development, New Delhi.

Jabotabek Advisory Team. 1980. *Proposed Guided Land Development Programme for Greater Jakarta, Technical Report No. T/29.* Directorate General of Human Settlements, Department of Public Works, Jakarta, December.

_____. 1981. *Jabotabek Metropolitan Development Plan, Executive Summary, Implementation Report No. I/1.* Directorate General of Human Settlements, Department of Public Works, Jakarta, June.

Kalbermatten, John M., DeAnne S. Julius, and Charles Gunerson. 1982a. *Appropriate Sanitation Alternatives: A Technical and Economic Appraisal.* World Bank Studies in Water Supply and Sanitation, Baltimore: Johns Hopkins University Press.

_____. 1982b. *Appropriate Sanitation Alternatives: A Planning and Design Manual.* World Bank Studies in Water Supply and Sanitation, Baltimore: Johns Hopkins University Press.

Keare, Douglas H., and Scott Parris. 1982. *Evaluation of Shelter Programs for the Urban Poor: Principal Findings.* World Bank Staff Working Paper No. 547. Washington, D.C.: The World Bank.

Kingsley, G. Thomas and Sarah W. Wines. 1987. *Town Planning and Land Development in Jamaica: An Agenda for Reform, Final Phase I Report.* USAID Sponsored Town Planning Review Project. Washington, D.C.: The Urban Institute. June.

Kingsley, G. Thomas. 1989a. "Regulating the Development of Urban Land: Opportunities for Reform," in *Urban Land Management in the Caribbean: Proceedings of a USAID Sponsored Conference in Castries, St. Lucia.* July.

Kingsley, G. Thomas, Jeffrey P. Telgarsky, and George E. Peterson. 1989c. *Urban Land and Infrastructure: Project Opportunities for AID in India.* Report 3919 to USAID/India. Washington D.C.: The Urban Institute.

Kingsley, G. Thomas, Robert Olsen, and Jeffrey P. Telgarsky. 1989d. *Improving Jamaica's Land Regulations and Processing Systems.* Final Phase II Report of the USAID Sponsored Town Planning Review Project. Washington, D.C.: The Urban Institute. August.

Sponsored Town Planning Review Project. Washington, D.C.: The Urban Institute. August.

Kitay, Michael G. 1985. *Land Acquisition in Developing Countries: Policies and Procedures of the Public Sector.* Oelgeschlager, Gunn and Hain in Association with the Lincoln Institute of Land Policy.

Lee, Kyu Sik and Alex Anas. 1989. *Manufacturers' Responses to Infrastructure Deficiencies in Nigeria: Private Alternatives and Policy Options.* Discussion Paper. Washington, D.C.: The World Bank.

Linn, Johannes F. 1982. "The Costs of Urbanization in Developing Countries," in *Economic Development and Cultural Change.*

_____. 1983. *Cities in the Developing World: Policies for Their Equitable and Efficient Growth.* A World Bank Research Publication, Oxford University Press, January.

Ljung, Per and Farvacque, Catherine. 1988. *Addressing the Urban Challenge.* A Review of the World Bank FY87 Water Supply and Urban Development Operations. March.

NAHB (National Association of Home Builders). 1986. *Cost Effective Site Planning.* Washington, D.C.: National Association of Home Builders.

National Commission on Urbanization. 1988. *Report of the National Commission on Urbanization, Volumes I and II.* New Delhi: Government of India.

NUDS (National Urban Development Strategy Project). 1985. *National Urban Development Strategy Project Final Report.* Jakarta: Directorate General of Human Settlements, Department of Public Works, Government of Indonesia, and United Nations Centre for Human Settlements.

NUDS (National Urban Development Strategy Project)/PADCO. 1985a. *Analysis of Urban Services Standards, Technologies, and Costs.* Jakarta: Directorate General of Human Settlements, Department of Public Works, Government of Indonesia, and United Nations Centre for Human Settlements.

_____. 1985b. *Urban Services Investments for Alternative Strategies.* Jakarta: Directorate General of Human Settlements, Department of Public Works, Government of Indonesia, and United Nations Centre for Human Settlements.

Niedercorn, John and Edward F.R. Hearle (1963). *Recent Land Use Trends in Forty-Eight Large American Cities.* Report RM-3664-1-FF. Santa Monica, Calif.: The Rand Corporation.

PADCO, Inc. (with Engineering Consultants Group and Sherif El-Makim and Assoc.). 1982. *Final Report: The National Urban Policy Study*. Prepared for the Advisory Committee for Reconstruction, Ministry of Development, Arab Republic of Egypt, and U.S. Agency for International Development.

_____. 1986. *Land and Housing Markets in Bangkok: Strategies for Public Sector Participation. Washington, D.C.: PADCO, Inc.*

Peterson, George E., Ted Miller, Nancy Humphrey, and Christopher Walker. 1986. Infrastructure Needs Studies: A Critique. Washington D.C.: The Urban Institute.

Peterson, George E., G. Thomas Kingsley, and Sarah Wines. 1986. *Urban Infrastructure: Pilot Studies and Development Strategy*. Urban Institute Report prepared for the Office of Housing and Urban Programs, U.S. Agency for International Development. Washington, D.C.: The Urban Institute. July.

Peterson, George E., G. Thomas Kingsley, and Jeffrey P. Telgarsky. 1990. "Multi-Sectoral Investment Planning." Discussion Paper prepared for the United Nations Centre for Human Settlements Urban Management Programme.

Prakash, Ved. 1977. *A Study of Fiscal Policy and Resource Mobilization for Urban Development*. Manila: Asian Development Bank.

_____. 1982. *Financing Urban Development in Developing Countries*. UNCRD Working Paper 82-6. Tokyo: UNCRD.

RERC (Real Estate Research Corporation). 1974. *The Costs of Sprawl: Detailed Cost Analysis*. Washington, D.C.: U.S. Government Priniting Office.

Reno, Arlee and Harry Cohen. *Rationalization of Procedures for Highway Cost Allocation*. Report to the Trucking Research Institute. Washington, D.C.: The Urban Institute.

Richardson, Harry W. 1976. "The Costs and Benefits of Alternative Settlement Patterns: Or Are Big Cities Bad," in United Nations, *The Population Debate-Dimensions and Perspectives*, Vol. 2. New York: United Nations.

_____. 1984. "Urban Crisis and the Resource Crunch in Pakistan," Washington D.C.: The World Bank. mimeo.

_____. 1987. "The Costs of Urbanization: A Four-Country Comparison," in *Economic Development and Cultural Change*, Vol. 35, No. 3. April.

Strassman, Paul. 1982. *The Transformation of Urban Housing: The Experience of Upgrading in Cartagena*. Baltimore: Johns Hopkins University Press.

Town and Country Planning Organisation (1983). *Urban Land Use and Density Patterns in India.* New Delhi: Ministry of Works and Housing, Government of India.

United Nations. 1988. *Global Strategy for Shelter to the Year 2000.* Report to the Commission on Human Settlements on the Work of the Eleventh Session, Document A/43/Add.1. United Nations General Assembly, New York.

UNCHS (United Nations Centre for Human Settlements). 1987. *Global Report on Human Settlement, 1986.* New York: Oxford University Press.

Whittington, Dale, Donald T. Lauria, Daniel A. Okun, and Xinming Mu. 1989. "Water Vending Activities in Developing Countries: A Case Study of Ukanda, Kenya." *International Journal of Water Resources Development,* Vol.5, No. 3. September, pp. 158-168.

Whittington, Dale, Apia Okorafor, Augustine Okore, and Alexander McPhail. 1990. *Cost Recovery Strategy for Rural Water Delivery in Nigeria.* Washington, D.C.: The World Bank.

World Bank. 1983. *Notes on the Design and Operation of Waste Stabilization Ponds in Warm Climates of Developing Countries.* World Bank Technical Paper Number 7. Washington, D.C.: The World Bank.

_____. 1986a. *India: Urban Land Management Study.* Sector Paper, Report 5984-IN. Washington, D.C.: The World Bank. January.

_____. 1989. *Malaysia: The Housing Sector, Getting the Incentives Right.* Report No. 7272-MA. Washington, D.C.: The World Bank. April.

Yepes, Guillermo. 1990. *Management and Operational Practices of Municipal and Regional Water and Sewerage Companies in Latin America and the Caribbean.* Discussion Paper. Washington, D.C.: The World Bank.

Chapter Four

MUNICIPAL DEVELOPMENT FUNDS

Using capital from the private sector to finance urban infrastructure investment implies borrowing funds at interest rates which reflect both the market cost of capital plus the private lenders' estimation of the risk involved in lending to the particular borrower. This is the predominant model used by U.S. municipalities and infrastructure agencies to finance their investment projects.

The main advantage of having municipalities use private capital markets to finance their investments is efficiency. Infrastructure projects are forced to compete with other investment opportunities in the economy for funding. Market efficiency dictates that only those projects which can generate adequate financial returns or are valued sufficiently by the responsible local government (in terms of the cost of servicing the debt from current revenues) will be undertaken. Under such a system (in theory), investment decisions could be made based on objective criteria--project cost, cost of capital, and revenues/benefits from the project--in a fashion similar to how banks appraise loan applications from commercial borrowers.

Borrowing directly from private lenders is not the only model for tapping private capital sources. Municipal credit institutions (MCIs) which borrow from the private sector and on-lend to local governments are well-established in Western Europe and Japan. As will be seen below, however, this extra layer of intermediation creates room for a slackening of the market discipline which private borrowing is supposed to provide.

The wide use of these intermediaries between private lenders and municipal borrowers requires some explanation. Dillinger (1989) cites some reasons why the private sector may be unwilling to lend directly to municipal governments and infrastructure agencies or why the central government may wish to intervene against a market allocation of credit to local governments:

- *Lack of creditworthiness.* The creditworthiness of municipalities and infrastructure agencies may not be well-established. Private lenders may be reluctant to lend funds without some form of assurance from central government. (Indeed, this is the position of most international donors, who will not loan funds without a central government guarantee.) As a result, local authorities, on their own, may only be able to raise small amounts of capital which carry substantial risk premia--in LDCs, often in an environment where free-market lending rates are already high in real terms.

- *Central government policy.* Central government may wish to play a role in credit allocation to the local level for policy reasons: managing the overall level of public sector

debt; guiding the distribution of investment to sectors with national priority for development; ensuring that credit resources are equitably spread between financially stronger and weaker municipalities and infrastructure agencies.

The simplest institutional form of intermediation between private lenders and local governments would be for the central government to act as the borrower and to lend the funds to municipalities through annual budget allocations. In practice, MCIs have been set up to place some distance between local infrastructure investment and the central budget process. This approach is thought to have two advantages:

- *Greater financial accountability.* If MCIs bear the risk of local government default, they are likely to examine the creditworthiness of borrowers carefully and collect debt service payments dilligently.

- *Better project selection.* Placing the project selection process within the control of a technical institution like the MCI may shield the process from political interference.

In developing countries, where the obstacles to direct borrowing by municipalities are large, MCIs--or, as they are more commonly called in LDCs, municipal development funds (MDFs)--have proliferated as a means of moving local governments from dependence on central government funds to creditworthy borrowers able to deal directly with private lenders. The following section looks at whether the experience with MDFs to date is grounds for belief that such a transformation is underway.

A. OPERATION OF MUNICIPAL DEVELOPMENT FUNDS

Sources of Funds

Municipal development funds and other financial intermediaries set up to channel capital to local governments have developed as a very common vehicle for financing the investment needs of urban areas. Kenneth Davey, in a brief summary of these institutions prepared for the World Bank (Davey, 1988), identified a total of thirty-one financial institutions or mechanisms for financing urban investment in developing countries; this list is probably incomplete.

The models to which the MDFs aspire are the MCIs of Western Europe, which seem to be successful examples of specialist institutions catering to the investment finance needs of local governments. Many of these institutions rely on bond issues (floated to investors through the national capital market) and deposits (from individuals as well as local governments) as their main sources of capital. Thus, some of these institutions have apparently been able to tap private sector savings to support municipal investment programs.

It should be noted, though, that none of these intermediaries operates as a "pure" market-oriented institution. All of the MCIs have their assets backed by some form of guarantee. In

France and Japan, the loans made by the institutions to municipalities are explicitly guaranteed by the central government. In other countries, the central government is perceived as granting an implicit guarantee either through holding a significant part of the equity capital of the institution or by allowing the institution's loans to be secured by physical or financial assets owned by the municipalities. In any case, these guarantees have not had to be tested in recent years and the institutions have faced little difficulty in raising funds in both national and European capital markets.

However, not all Western European municipal finance institutions raise funds through bonds and deposit taking. Several countries provide municipal investment financing by providing credit to the institutions from the central government. In Britain, the Public Works Loan Board (PWLB) is financed by borrowing from the central government's national loan pool. The central government has attempted to use the PWLB as a mechanism for applying central control over the level of local government debt and sectoral distribution of investment. However, in practice, the system controls neither: local governments have other sources of capital finance (such as operating surpluses or sale of assets) and the approval of individual projects is uncoordinated and spread across several ministries.

The Banco de Credito Local in Spain has raised over two thirds of its loanable funds by borrowing (mainly at below-market interest rates) from the central government. It is gradually moving toward market-rate sources of finance, but these are still mainly provided through the central government.

Finally, in West Germany, a large part of infrastructure finance is provided through borrowing from municipal savings banks. These banks, owned by municipalities (or groups of municipalities) and linked through a national municipal savings bank, are able to attract deposits at relatively low cost (due to the limited investment opportunities in the German financial system for small investors). This low cost of funds allows the banks to on-lend to local governments at attractive rates. The banks, of course, are eager to do so, since they are owned by the local governments to whom they lend. However, there are statutory limits on the amount of lending to local government allowed in the bank loan portfolio.

The experience with MDFs in LDCs parallels the variety of funding arrangements found in Western Europe--with one exception: there are no documented examples of municipal finance institutions in these countries which rely on the private sector as a source of funds--even where government guarantees (explicit or implicit) are given. Of the thirty-one developing countries which Davey (1988) lists, only six have municipal finance institutions which rely on bonds or deposits as sources of loanable funds. However, closer examination of the use of these instruments shows that they are not reflections of market-oriented tapping of private capital sources.

In Honduras, for example, the bonds sold by the Banco Municipal Autonomo (BANMA) are bought by public sector employees pension fund (presumably under the direction of the government), not by individual or corporate investors from the private sector. Similarly, the

Cities and Villages Development Bank (CVDB) in Jordan also issues bonds to raise loanable funds. These bonds are bought mainly by insurance companies--not because they are a competitive investment, but because they are an acceptable instrument for meeting the companies' regulated reserve requirements. In other cases, the proportion of funds raised through the sale of bonds or acceptance of deposits is small compared to the other sources of funds from the public sector.

MDFs tend to rely mainly on public sector capital, either in the form of transfers from the central government (such as in Kenya and Indonesia) or mandatory deposits by local governments (as found in Honduras, Jordan, and Brazil). In Kenya, the Local Government Loans Authority (LGLA) is authorized to finance its operations by floating bonds or other debt instruments. In fact, the LGLA acts simply as an on-lending agent for funds from the Ministry of Local Government (MLG) and foreign donors. Its only self-generated funds are those raised through investing the undisbursed balance of the MLG funds and the spread between its borrowing and lending rates. The proposed Regional Development Account (RDA) in Indonesia will act as an on-lending agent for funds provided by the central government and foreign donors.

The Honduran central government requires all local governments to deal exclusively with BANMA: it handles all transfers from the center to the local level; it must hold all municipal funds on deposit; and municipalities must purchase capital shares in the institution equal to 5 percent of their annual revenues. Similar arrangements are common with many MDFs: both the CVDB in Jordan and the Parana Urban Development Fund (FDU) in Brazil directly receive and hold transfers to local governments from central government as deposits by the municipalities.

Project Selection and Lending Practices

As noted above, one of the rationales for using MDFs to channel funds to local governments is to help them develop into creditworthy organizations to which the private sector will be willing to lend. (A common observation in World Bank reports on urban development is the lack of consistent standards for evaluating and discriminating between various urban investment projects.) Thus, a key component of most MDF programs is improvement of the technical ability of local governments to design and select investment projects and to improve the ability of local government to service its debts.

Typically, the MDF establishes standard information requirements and appraisal procedures which must be fulfilled by the municipality in order for the project to be eligible for funding. The Calcutta Municipal Development Program, for example, required that each participating local government unit submit information on: municipal financial performance; required staffing; how the project fit into sector objectives; economic costs and benefits; and implementation issues. Beyond this sort of project specific analysis, many MDFs also require local governments to produce medium-term investment plans before individual projects can be financed.

In addition to these project-related assessments, MDFs also typically monitor the municipality's ability to service its contracted debt. This is usually done by placing statutory limits on debt, such as the ratio of debt or debt service to revenues. The limits for Santa Catarina MDF in Brazil are representative examples:

- Total outstanding debt must not exceed 70 percent of the previous year's total revenue.
- The debt contracted in one year must not exceed 20 percent of annual revenue.
- Debt service should not exceed 15 percent of the previous year's revenue.

To improve the ability of municipalities to service their debt, most MDFs offer assistance to local government to boost revenue collections and promote cost recovery. Where feasible (such as with water systems, solid waste collection, and markets, and transport facilities), MDFs often require projects to be self-financing through user-fees and charges. Where projects are not self-liquidating, MDFs will work with borrowers to improve tax collections and provide technical assistance for updating tax rolls, collection techniques, and financial control. In a few cases, the implicit increased access to funds is supplemented by changes in the formulae which allocate inter-governmental transfers which reward localities improving their own financial performance.

In practice, these policies have not always proved successful in increasing local government capacity. One recurring problem is to what degree the MDF allows local governments to act independently. In Honduras, municipalities have complained that they have little say in most of the projects financed through BANMA. The projects are selected, designed, and built entirely under the control of BANMA or other central government agencies. The completed project--with its recurrent debt service and operating and maintenance costs--is then turned over to the locality. Similarly, the Calcutta MDF has relied on the secondment of technical staff from the state government to assist in project design, leading to conflicts between local priorities and the views of technicians who will return to their state agency.

A second problem is that the financial tests imposed on municipalities have not always been accurate in their assessment of a local government's capacity to borrow. In Jordan, the requirement that debt service not exceed 80 percent of national revenue shares proved to be a misleading indicator of local borrowing capacity. The formula over-estimated the borrowing capacity of small municipalities, which tended to be highly dependent on revenue transfers from central government. These local governments became highly indebted and could not maintain their previous levels of recurrent expenditure because most of their transfers were earmarked for debt service. In contrast, larger localities, which had greater sources of their own revenues, were limited in their borrowing at a level below which they could afford.

Thirdly, the incentives built into MDFs' lending structures have not always worked as planned. In Calcutta, state capital grants to local governments were to be linked with the municipality's financial performance against the projected deficit. However, the value of the incentive has been weakened by the state's reluctance to fully implement the incentive program and reduce the capital grant to municipalities which consistently exceed their projected deficit.

Repayment Performance

The second major component of MDFs as instruments for assisting local governments transform themselves into creditworthy borrowers is the discipline of repayment which the lending institution is supposed to impose. Has this, in fact, been the case?

The record of MDFs in developing countries is not encouraging on this point. Almost every MDF shows substantial repayment problems and those which do not are able to avoid the build-up of arrears only through deduction of debt service from central government transfers before their distribution to the local level.

Some MDFs have attempted to improve the motivation of local governments to keep current in their debt service through mandatory purchases of capital in the institution by the municipalities or by requiring all municipal funds to be held as deposits with the MDF. Experience in Honduras and Jordan has shown such approaches to be ineffective.

In Honduras, only 37 percent of the owed municipal capital due to BANMA had been paid in by the end of 1988. At the same time, total delinquent loans far exceeded the institution's capital base, despite the rescheduling of several loans. As a result, BANMA has become almost entirely dependent on foreign sources of funds to continue its operations. It has also felt forced to become more involved in the operations of local government in order to secure adequate revenues to repay outstanding borrowings, taking on the task of collecting revenues, user-fees, and charges directly for debt service.

In Jordan, the CVDB (which holds all municipal funds as deposits) has encountered similar problems. Local authorities' interests as borrowers tended to override their collective interest as depositors. As a result, many municipalities borrowed more than they could afford to service--in some cases, where borrowing limits were overridden, debt service exceeded the total of value of transfers from the central government. As a result, the central government has had to assume some of the debt service obligations of local governments.

In the cases described above, the MDFs have stopped net new lending to those municipalities which are in arrears (though new loans may be made to re-finance existing loans in default). However, even this obvious limit is not enforced by some MDFs. In Kenya, the lack of standard eligibility requirements for loans through the LGLA allows the MLG to approve loans both to localities which are financially weak (and unlikely to meet future debt service obligations) or which are already in arrears on their existing obligations to the LGLA.

The experiences outlined above and in the previous section point out a number of factors which greatly reduce the incentives of local governments to service debt they incur from MDFs:

- *Absence of sanctions for non-repayment.* The greatest disincentive to debt servicing is the apparent lack of sanctions for default by the local government on its borrowings from the MDF. In almost every case, local authorities which fail to service their debts continue to receive support from the central government through debt forgiveness, continued access to credit, and adjustments to transfers to eliminate the effect on current revenues of increased levels of debt.

- *Ineffective coordination.* MDFs and local authorities fail to coordinate in one of two fashions: (1) MDFs tend to take over municipal investment decision-making, leading local governments to assume they have no real obligation to service debt over which they had no influence; or (2) MDFs lend without adequate assessment of investment projects (i.e., where returns are very low or no capacity for cost recovery is in place).

- *Lack of control over revenue streams.* Where MDFs have first claim on transfers from central government and/or where transfers are not made on a reliable and timely basis, local governments appear to give low priority to debt service. Municipalities apparently heavily discount future transfers and would rather maximize current access to funding.

Current Development of MDFs

The Western European MCIs have been the most successful in moving away from public sector funding. Two characteristics of these institutions are relevant to the experience with similar institutions in developing countries. First, even the Western European lenders do not operate like "pure" private sector entities which (with their depositors) bear all the risk of the borrowers' creditworthiness. Some form of public backing is given to all of the institutions activities. Second, even as recently as twenty years ago, many Western European municipal lenders (such as those in Spain, Italy, and France) functioned in a manner very similar to the way their LDC counterparts do today--relying mainly on public sector sources or directed credit to fund their lending. The history of municipal finance institutions in Western Europe indicates that it is possible to develop sustainable lending programs for local governments. The questions are: What path of development is most suitable? How can the problems of default by municipalities be dealt with?

The experience in Western Europe and with World Bank and USAID projects in developing countries point to three different paths of development now being followed for municipal finance institutions:

- Private sector "commercialization";
- Increased efficiency within the public sector;
- Municipal self-sufficiency.

Private sector "commercialization." In this case, the financial institution is established as an autonomous entity outside of the direct control of government (although the government is usually an equity participant). The aim, though, is to have the institution operate as a commercial enterprise, applying profit-oriented approaches to evaluating both the technical and financial capabilities of borrowers and to securing loanable funds through deposits and bond issues. The end result is a financial institution much like those in Western Europe which rely mainly on the private sector for their loanable funds and face low levels of default or non-performance on their loans.

The CVDB in Jordan is an example of this approach being carried out in a developing country. While some progress has been made, many of the key hurdles have not yet been cleared. As noted above, the CVDB has not yet been able to tap private sector funds in a competitive fashion. In addition, management decisions on lending (based on technical and financial appraisal of the proposed project) have to be confirmed by the Board. Many refusals were overturned, with poor results. Several municipalities have defaulted on their loans and the central government has stepped in to meet their debt service payments. Reforms have been put in place to give greater weight to the CVDB management recommendation. However, as long as municipalities are not penalized for undertaking unsound or over-ambitious projects, the CVDB will be forced to shoulder all of the decision-making responsibility and risk associated with municipal investments.

Increased efficiency within the public sector. The World Bank's approach in Latin America has been to address the operational side of municipal finance institutions without getting involved in the source of their loanable funds. This approach is designed to transform an existing ad hoc grant system into a more rational resource allocation mechanism (which reflects the true cost of capital) and to help build technical capacity in local governments. The finance institutions not only provide loans, but also assist municipalities in the planning, design, and implementation of projects as well as providing support for fiscal improvements. The borrowers are usually required to undertake cost recovery measures to ensure repayment of the loan.

This model is being undertaken in Brazil and Argentina by the Bank. In Parana State, Brazil, the Municipal Capital Improvement Program (MCIP) finances urban investments for market towns with less than 50,000 inhabitants. The MCIP is supported by a grant from the state government (allocated on the basis of a set formula) and a World Bank loan (which acts as a revolving fund for loans). The loans are evaluated and if accepted, are secured by claims on the municipalities value-added tax receipts (which are channelled through the State Bank) and by implementation of a cost recovery program for the project. Early experience with the MCIP indicates that relations between local governments and the state government have

changed dramatically, as municipalities are able to predict the availability of investment funds more accurately than under the old ad hoc grant system. Local governments have been eager to take up loans and the repayment experience to date has been good (since failure to make payments reduces transfers from the value-added tax). The MCIP has not been so successful in providing technical assistance; most of the projects funded are small and less technically demanding (i.e. roads, bridges, and community facilities rather than water, sanitation, and power).

Municipal self-sufficiency. The third model is based on municipalities acting on their own behalf to mobilize resources for investment. German local governments are the only documented example of this approach (described in the previous section), whereby the municipality owns a savings bank which caters to local savings and then lends back to the municipality. Though there is potential for abuse of borrowing privileges by the local government, countervailing factors are also present: supervision and regulation by national banking authorities limits loan exposure by the bank to local governments; collapse of the bank would have serious political consequences for the municipal government.

Future Role of MDFs

In all of these models, the public sector has an important role to play in ensuring the security and viability of the system. Only if the private sector is convinced that the risk of loss from participating in financing municipal investment is sufficiently low (compared to other investment alternatives), will municipal financial institutions be able to attract private capital. This has been the pattern in Western Europe, where increasing confidence in the creditworthiness and borrowing discipline of local governments has allowed greater reliance on the private sector as a source of loanable funds (though government guarantees still persist).

In developing countries, this development has not taken place. As noted above, local governments often do not face any penalty for failing to meet their debt obligations; no inducement, such as being cut off from further credit or having their other revenues impounded, forces them to be more disciplined in their borrowing. Until incentives for being a "well-behaved" borrower exist for local governments, they will persist in attempting to wring as much credit with the least cost possible out of the municipal finance system.

REFERENCES

Davey, Kenneth. 1988. *Municipal Development Funds and Intermediaries. Policy, Planning, and Research Working Paper No. 32. Washington, D.C.: World Bank.*

Dillinger, William. 1989. "External Sources of Local Government Finance." In Strengthening Local Governments in Sub-Saharan Africa. EDI Policy Seminar Report No. 21. Washington, D.C.: World Bank.

Humphrey, Nancy, and Harold Wolman. 1984. "Urban Infrastructure: Learning from Abroad." Washington, D.C.: The Urban Institute.

International Centre for Local Credit. 1986. *Credit Institutions for Local Authorities: Country Reports.* The Hague: ICLC.

Reidenbach, Michael. 1983. "Municipal Public Infrastructure in the Federal Republic of Germany." Berlin: Deutsches Institut fur Urbanistik.

World Bank. 1988. *Seminaire sur les Banques de Developpement Local dans les Pays du Maghreb.* Proceedings of conference held 7-11 March 1988, Hammamet, Tunisia.

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