FINANCING INFRASTRUCTURE INVESTMENTS IN SOUTH AFRICA:
Intergovernmental Fiscal Relations and Grant-Loan Linkages

by

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ABSTRACT

Four decades of Apartheid has left South Africa with one of the most unequal income distributions in the world. This inequality is reflected in the access to infrastructure services across different population groups and geographical regions. A major challenge to the new government is to address this inequality and ensure that everybody has access to at least basic levels of infrastructure services. A first step in this process is restructuring and redefining the role of local governments.

South Africa is embarking on a process of decentralization in the hope that placing greater responsibilities with local governments will facilitate infrastructure service delivery. An analysis of local government revenue and expenditure shows a fairly decentralized system already in place, although income disparities force certain local governments to rely more on grant transfers than others. Policy should, and does, focus on ways in which local governments can be strengthened fiscally and institutionally in order to enhance service delivery capacity.

This thesis outlines the evolution of local governments in South Africa, details the backlog which exists in infrastructure services, the cost of upgrading existing and providing new infrastructure services, and develops a framework for identifying the various sources of finance which may be available to local governments for financing infrastructure investments. Emphasis is specifically placed on linking grants from higher tiers of government with loans from private sources. It is argued that a grant-loan linkage system will help meet national equity objectives while not attenuating incentives of local governments to borrow. Borrowing from private sources will impose financial discipline on local governments, thereby encouraging efficiency in infrastructure service delivery.

While there are many ways to design a grant-loan linkage system, an example is developed to show how such a mechanism may work. Ultimately the design of a grant-loan linkage system will depend on the political, economic, and social conditions of the country where it is to be implemented.

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The usual disclaimer applies.

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List of Acronyms

AB	Administrative Board
BLA	Black Local Authority
CC	Community Council
DIFR	Department of Intergovernmental Fiscal Relations
DOF	Department of Finance
FFC	Financial and Fiscal Commission
JSB	Joint Service Board
LA	Local Authority
LG	Local Government
LGTA	Local Government Transition Act
LOS	Level of Service
MC	Management Committee
MIIF	Municipal Infrastructure Investment Framework
MSS	Metropolitan Sub-Structure
RDP	Reconstruction and Development Program
RSC	Regional Service Council
SALDRU	Southern Africa Labor and Development Research Unit
SC	Service Council
SGTs	Self-Governing Territories
TLC	Transitional Local Council
TMC	Transitional Metropolitan Council
WLA	White Local Authority

Chapter I. Introduction and Objectives

Fiscal decentralization has been receiving widespread attention in both academic and policy-making circles, and while its beneficial and harmful effects are hotly debated, most national governments see it as a means to alleviate pressure on the central fiscus, while transferring decision-making responsibility to sub-national and local levels of government. Decentralization implies that different tiers of government are not only responsible for how they spend their money, but they are also expected to raise most of their own revenues to finance such expenditures.

A. Thesis Objectives

This thesis will develop a framework for making decisions about financing the capital expenditure (investment) associated with infrastructure service delivery. The main question to be addressed is: what avenues of funding are available to -- and appropriate for -- local governments? I will develop a methodology which could be used to inform the policy-maker of various financing options available for investment based on the characteristics of various types of projects and the local governments.

There has been considerable emphasis regarding the local government financing of projects via revenue raised through either direct cost recovery (user charges), local taxes, or loans. Given the significant investment expenditure associated with infrastructure projects, most local governments will not be able to finance them fully through the local tax base on a "pay-as-you-go" basis, but will have to borrow money. The limited tax base of local authorities means that the amount they can borrow to finance the fixed investment costs will also be limited. This relationship is a direct one: the poorer a local government the less likely it is to obtain loans through the private capital markets. A certain amount of grant money would therefore be needed from the central (or sub-national/provincial) authorities, especially if equity or distribution issues were a concern. This raises the question of how to

structure a grant and loan system which will help with equity objectives, while not attenuating the incentives of local governments to borrow. While it is generally assumed that grants should be made only to poorer local governments and loans used only in richer ones, this thesis will investigate the manner in which grants and loans could possibly be linked in all types of local governments and projects in order to encourage greater equity and efficiency.

South Africa will be used as a case study because it is a country which is rapidly decentralizing its fiscal structures from the central to sub-national (provincial) and local (municipal) governments. The new government has constitutionally committed itself to a program of fiscal decentralization. The Department of Intergovernmental Fiscal Relations (DIFR) within the Department of Finance (DOF) has made proposals to decentralize the entire national fiscal structure and reform intergovernmental fiscal relations accordingly. The proposals are very broad and the DIFR suggests that the central government will provide a grant transfer to local authorities so that they can have at least a basic level of infrastructure service (which includes water supply, sanitation, storm drainage, electricity, and roads) within a ten year period (Department of Finance 1996). Should the local government desire a level of service provision above basic, it will have to borrow money to finance the investment. This proposal overlooks the ability of various local authorities to raise money, and the fact that some may need more than others, based on their ability to borrow.

B. Thesis Outline

This thesis develops a framework for financing infrastructure projects, paying special attention to linking grants and loans to encourage equity and efficiency. The aim of the thesis is to provide a means by which an integrated system of financing infrastructure projects under fiscally decentralized government structures can be made operational.

Chapter II describes the evolution of South Africa's local government structure from the Apartheid era, during which local governments were defined along racial lines, to the post-Apartheid era

when local governments of all race groups were amalgamated. Local governments, like their provincial counterparts, exhibit wide disparities in income and fiscal capacity, posing a problem for local infrastructure service delivery as affordability varies widely. The amalgamation of financially strong White local authorities and fiscally weak Black ones has caused marked inequalities in access to services even within local governments.

An assessment of infrastructure service needs is made in Chapter III, which shows how Apartheid caused access to services to be defined along racial lines. Provinces also portray wide variances in access to infrastructure services. Five infrastructure services are discussed, namely: water, sanitation, storm drainage, roads, and electricity. The data in this section draws mainly on the SALDRU (1994) household survey and the assessments of the infrastructure backlog in urban areas made by the MIIF (South Africa 1995a,b). The chapter highlights the number of people who live in deprived low-income settlements, and assesses the infrastructure backlog by showing access to each type of infrastructure broken down by level of service.

The cost of addressing the backlog in infrastructure service delivery is analyzed in Chapter IV. Addressing the backlog will require two stages: first, existing infrastructure services will have to be upgraded, and second, infrastructure services will have to be provided in new settlements, known as "greenfield" development sites. The cost estimates are made assuming that the backlog will be addressed over a period of ten years.

Chapter V discusses the role of local governments in infrastructure service provision. First, the role of local governments is spelled out as defined by the new constitution, the local government transition act, and the MIIF. The share which local and provincial governments command in revenue and expenditure patterns of total government are presented to show the financial strength of each. In order to assess their ability to deliver services, revenues are broken down by tax and non-tax sources, and expenditures are disaggregated into its current and capital components. Finally, an outline is given of

various short-run grant (and subsidy) programs intended to kick-start infrastructure delivery by local governments, while at the same time building local capacity for service delivery.

Intergovernmental grants are needed to address equity concerns in infrastructure service delivery, but it is also the policy of the central government that local governments should -- as far as possible -- borrow money to finance capital expenditures, and rely heavily on local revenues to cover operating costs. Chapter VI develops the vector financing method (VFM) for linking different types of grants and loans from various sources, in order to facilitate local governments' expenditures on infrastructure investments. The financing methods chosen will depend on the characteristics of the local government and the type of project being considered. An application of the framework shows how it may be made operational by allowing decision-makers to observe the impacts which different policies may have on desired outcomes.

Chapter VII provides an application of how a grant-loan linkage system might be made operational. A lack of data limits the empirical application of the method, although it does allow a conceptualization of the process of splitting grants and loans in infrastructure finance.

Chapter II. Local Government Structure in South Africa

The South African government has committed itself to a policy of decentralization, or more accurately to one of strengthening local governments and granting them greater autonomy. A major objective is to transfer the responsibility for infrastructure service provision to local governments (LGs) thereby allowing for greater decision-making at the local government level, and encouraging community participation. This is based on the assumption that local governments' performance will be improved if they work more closely with communities and grass-root organizations. Community participation should allow the government to better assess communities' needs, their willingness to pay for services, and their preferences (demand) for different combinations of service levels for various infrastructure services.

This chapter details the evolution of the local government structure in South Africa. First, a brief overview of the structure during the Apartheid era is given. This is followed by an outline of the current structure, which is a result of the transition to democracy following the April 1994 elections.

A. Apartheid Structure of Local Government

Under Apartheid each racial group was "governed" by a separate authority in order to meet the national government's objective of racially segregated development. On a national scale the government passed the Land Acts of 1913 and 1936 creating reserves in the form of four homelands and ten self-governing territories (SGTs) designed to contain the African population. The Native Urban Areas Act of 1923 allowed Africans to live in townships within "White" urban areas outside these reserves. These townships were generally low-income African urban settlements, whose inhabitants tended to be informal squatters. African settlement within the urban areas outside the reserves were seen as temporary, and pass laws were used to enforce a policy of influx control, which aimed at controlling the African urban population and the African labor force in urban areas. When the National Party assumed power in 1948 the Group Areas Act was passed, and it effectively sought to create the "Apartheid city"

by segregating each population group, creating separate residential and commercial areas for Whites, Coloreds, Indians and Africans.[1]

Before 1971 the White Local Authorities (WLAs) administered the African townships within their jurisdiction. In 1971 the government passed the Bantu Affairs Administration Act, which established Administration Boards (ABs) for urban Africans, known in what was then the Cape Province[2] as Community Councils (CCs). The lack of credibility which these ABs and CCs had amongst their "constituents" led the government to pass Act 102 in 1982 creating fully independent and autonomous Black Local Authorities (BLAs), although they were subject to interventions and control from the provincial and central government. The BLAs were created to manage the African areas only, and did not include Coloreds and Indians in their jurisdictions.

In January 1976 the Minister of Finance appointed a committee of inquiry into the finances of local authorities (LAs), which published its findings in the Browne Report (South Africa 1980). The Browne Report was to devote special attention to the problems of financing "non-white" local authorities, to investigate the possibility of creating autonomous municipal authorities for Coloreds and Indians, and to propose ways to strengthen the ABs and CCs for Africans. The report focused primarily on Colored and Indian local authorities and gave very little attention to African local authorities, although it pointed out that Africans in particular had a serious backlog in local government facilities and services (South Africa 1980: p.15). A major conclusion of the Browne Committee (South Africa 1980: p.83) with regard to Colored and Indian municipalities was that:

> "In order to establish viable local authorities for Coloureds and Asians (*sic*)....a system of regular transfer payments from White to Coloured and Asian authorities should be introduced, whereby the payments would equal the calculated needs minus the ability to pay of Coloured and Asian authorities."

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[1] Use is made here of the South African Institute of Race Relations definition when referring to the different race groups. Four race groups are defined: Whites, Indians, Colored (people of mixed race), and African. The term Black is used to refer to all "non-white" groups, i.e. Indian, Colored, African.

[2] Before 1994 South Africa consisted of four provinces, four homelands and ten self-governing territories (SGTs). The new constitution abolished the homelands and SGTs, and created nine new provinces. The Cape Province, for example, has been split into the Western Cape, Eastern Cape (which includes the Transkei and Ciskei homelands) and the Northern Cape (which includes the Bophuthatswana homeland).

The notion of transfer payments on a regular basis from White to Colored and Indian local authorities is reiterated throughout the Browne Report. In November 1980 the Minister of Finance appointed a working group to conduct an in-depth review of the recommendations of the Browne Report. The findings of this committee were published as the Croeser Report (South Africa 1982). The Croeser Report expressed general agreement with many of the recommendations submitted by the Browne Report, but concluded that the system of direct transfer payments from White to Colored and Indian local authorities should not be accepted. Specifically, the Croeser Report (p.1) argued that:

> "...a number of recommendations made in the Browne Committee's Report were not acceptable. There was particular dissatisfaction about the recommendations relating to transfer payments from White local authorities to Coloured and Asian (*sic*) local authorities..."

It is clear that the Croeser Report's conclusion to reject the Browne Report's recommendation for fiscal transfers from White to Colored and Indian local authorities was politically motivated. In fact, the Croeser Report (p.34) argues that a recommendation which encourages direct transfer payments from White local authorities to those of other population groups is "politically highly vulnerable".

Historically, Coloreds and Indians fell under the administration of the WLAs, and in 1983 the government passed a constitution which created Management Committees (MCs) for these two groups in an attempt to create municipal authorities which would allow them to govern themselves. In reality the BLAs and MCs were created to support and strengthen the Apartheid ideology of separate development, and as such enjoyed very little, if any, political legitimacy amongst the people they were intended to serve. In addition they had very limited revenue sources, and were dependent on transfers from higher tiers of government in order to remain operational. Unlike their WLA counterparts, BLAs and MCs could not access capital markets for loans, and their small revenue bases meant that they could not invest in building the necessary infrastructure for their communities.

In order to address the infrastructure backlogs in the areas of greatest need, in 1987 the government established Regional Services Councils (RSCs), or Joint Service Boards (JSBs) as they were known in KwaZulu/Natal (van Ryneveld 1996). At first the RSCs consisted of White municipalities and

the Colored and Indian MCs. The African BLAs were allowed to join only after their fiscal "non-viability" was acknowledged by the central government (Manche 1994). The RSCs were intended to funnel transfers from the financially stronger WLAs to the fiscally weak areas in order to finance the capital expenditure of infrastructure projects. The fiscal crises faced by many BLAs effectively meant that the RSCs became a mechanism for bridging finance to cover the shortfall of current revenue over current expenditure. BLAs were very dependent on transfers from the central government in order to finance their services, and these grants accounted for 80% of BLA revenues (Ahmad 1996).

Even though the RSCs had representation from each population group's local authority, they were still an attempt to maintain the system of racially separated local governments, hence they lacked popular support and were exposed to the same opposition as were the BLAs and MCs. Furthermore, representations on RSC boards, and vote allocations, were proportional to the value of services consumed by local authorities, the direct result of which was to give greater power to WLAs, thereby entrenching the system of control and dominance by Whites.

B. Post-Apartheid Structure of Local Government

Section 40(1) of South Africa's new constitution[3] states that: "In the Republic, government is constituted as national, provincial and local spheres of government which are distinctive, interdependent and interrelated." The constitution contains chapters which spell out the role and function of the "Provinces" (Chapter 6) and "Local Government" (Chapter 10).

Local governments or municipalities[4] are granted the right to govern the affairs of their constituents, are required to give priority to the basic needs of their communities, and are to provide services in an equitable and sustainable manner. The constitution also calls for national and provincial

[3] Act 108 of 1996: Constitution of the Republic of South Africa. As adopted on May 8, 1996 and amended on October 11, 1996 by the Constitutional Assembly. The new constitution was signed into law on December 10, 1996.

governments to "support and strengthen the capacity of municipalities" (Section 154(1)). It is thus envisioned that South Africa will have a devolved structure of governance in which local authorities are responsible for managing their communities free from undue intervention from higher levels of government. A devolved government structure is one form of decentralization that "occurs when authority is transferred by central government to local-level government units holding corporate status granted under state legislation." (Cohen and Peterson 1996: p.10).

The idea of strengthening local governments is not a new one, although it could be argued that post-Apartheid South Africa represents the first attempt to strengthen local governments in a manner which promotes not only efficiency, but also racial and regional equity. The current focus on the role of local authorities thus presents the first real impetus to a policy of decentralization via the devolution of power to the lowest tier of government. As explained in the previous section, past attempts at reforming local governments were driven by Apartheid policies with very little regard for equity considerations or for the financial self-sufficiency of groups other than Whites. The current post-Apartheid structure of local government is of course no longer guided by such policies of racial segregation, and the amalgamation of WLAs and the LAs of other population groups into single LGs will to some extent facilitate the delivery of services within areas where there are deficiencies. The structure of LGs in South Africa is such that LAs form substructures in LGs, i.e. many LAs can make up a single LG.

The transition from Apartheid government structures to the new structures legislated by the new constitution consists of three phases, namely a pre-interim phase, an interim or transition phase, and the final phase (South Africa 1995a). During the pre-interim phase transitional councils prepared for local government elections which were held on November 1, 1995, with the exception of the Western Cape and KwaZulu/Natal, which held their local elections in May and June 1996 respectively. The interim phase began after the adoption of the new constitution on December 10, 1996. The final phase will come

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[4] The term municipality refers to the government of towns, which can be thought of as incorporated islands of human settlements separate from the administration of their rural hinterland (Davey 1988).

into effect once the second set of elections required by the new constitution have been held. At present, South Africa is therefore in the transition/interim phase as far as local government reform is concerned.

The institutional structure governing local authorities has undergone dramatic changes in response to the new constitution and the Local Government Transition Act (LGTA) No. 209 of 1993. The LGTA allowed for the approximately 1,300 racially segregated LAs to be amalgamated into 698 non-racial LAs. The new boundaries have resulted in three general types of urban local governments defined as "complex centers", "large urban centers", and "urban centers" (South Africa 1995b). The term "small centers" is used by South Africa (1995b) when referring to what are here called "large urban centers". The decision to use the latter rather than the government's "small centers" is due to the confusion that may otherwise result, as these "small centers" are generally larger in size than the "urban centers" and using the government's terminology could lead to the belief that they are smaller.

Complex centers refer to the metropolitan areas, in which a large number of WLAs and BLAs exist in close proximity to one another, often adjacent. The merged LAs constitute metropolitan areas managed by Transitional Metropolitan Councils (TMCs), which were established to replace Apartheid municipal structures. Former WLAs (including MCs) and BLAs were amalgamated into Metropolitan Sub-Structures (MSSs) which function within the TMCs. Each TMC contains two or more MSSs, which were elected during the local elections of 1995 and 1996. Two types of TMCs have emerged, known as "soft-top" TMCs and "hard-top" TMCs. With soft-top TMCs pre-existing LAs merge into a TMC, but LAs retain the boundaries and associated functions they had prior to the LGTA. Hard-top TMCs result from a redrawing of internal LA boundaries in a way which does not always respect pre-existing LA boundaries, and MSSs often do not retain all their functions and powers, which can be transferred to the TMC level. In cases where TMCs are not formed, Services Councils (SCs) serve as replacements for RSCs /JSBs in order to maintain service delivery. As such SCs retained RSC/JSB powers of taxation (payroll and turnover levies), and the ability to redistribute funds from higher to lower income areas.

Large urban centers are non-metropolitan urban areas where one or more BLAs merged with WLAs, resulting in what is known as a single Transitional Local Council (TLC). These urban areas (estimated to be about 400 towns) usually consist of WLAs which are fiscally weak and hence have limited capacity to expand services to the former black townships (or BLAs) with which they have been merged. TLCs are located within, and form part of Services Councils, which were created to replace the former RSCs and JSBs. In rural areas the TLCs form part of, and are located within, Regional Councils.

Urban centers refer to TLCs, which result from the merger of former distinctly urban WLAs with black townships and informal settlements located in the former homeland and Self-Governing Territories (SGTs). These TLCs are members of Services Councils (SCs), and contain BLAs which had the most centralized administrative structures for service delivery and relied heavily on central transfers to finance current and capital expenditures. As such, these LAs have the greatest potential to overburden the TLCs of which they form part. Also, given that they are smaller in size than TMCs, it is unlikely that they will experience any rapid expansion in their fiscal base and fiscal capacity.

Table 2.1: A Typology of Urban Local Government Structure

Class	Population	Local Govt. (LG)	Local Govt. Sub-structure (LAs)	Examples
Metropolitan	Over 2 million	TMC	MSS	Cape Town, Durban, Greater Johannesburg
Large Cities	500K - 2 million	SC	TLC	Port-Elizabeth, Pietermaritzburg
Medium Cities	100K - 500K	SC	TLC	Kimberley, Mmabatho
Small Towns	Less than 100K	SC	TLC	Upington, Tzaneen

Source: South Africa (1996)
TMC = Transitional Metropolitan Council, MSS = Municipal Sub-Structures, SC = Service Council, TLC = Transitional Local Council

Table 2.1 provides a typology of city sizes and their associated new local government structures in South Africa. The typology identifies four principle urban classes based on size and is consistent with the United Nations classification of cities in developing countries. City size is often strongly correlated

with average income levels, and a conurbation is usually characterized by a stronger fiscal base than a smaller urban area. Table 2.2 contains summary data for the nine new provinces of South Africa, presenting population and gross geographic product (GGP) per capita by province.

Table 2.2: Provincial Summary Statistics (Population 1995, GGP 1994)

	Population		Gross Geographic Product	
	Total ('000)	Proportion of National	Per Capita	Proportion of National
RSA	41,244	100.0	9,461	1.00
Gauteng	7,048	17.1	20,893	2.21
Western Cape	3,721	9.0	14,764	1.56
Northern Cape	742	1.8	10,848	1.15
Mpumalanga	3,007	7.3	10,625	1.12
Free State	2,783	6.7	8,647	0.91
KwaZulu/Natal	8,713	21.1	6,681	0.71
North-West	3,352	8.1	6,428	0.68
Eastern Cape	6,481	15.7	4,539	0.48
Northern Province	5,397	13.1	2,709	0.29

Source: Central Statistical Service (1997)

The data shows that four of the nine provinces have per capita incomes above the national average, which corresponds to 35% of the population living in provinces with above average per capita incomes and 65% with below average per capita incomes. Regional disparities also exist within provinces, and financial capabilities of LAs within cities also differ. The differences in income across regions have implications for the ability of various provinces and their LGs to address infrastructure service backlogs. The extent of the infrastructure backlog and how it varies across major metropolitan and other urban areas, and across population groups, is discussed next.

Chapter III. Infrastructure Service Needs in South Africa

This chapter will examine infrastructure shortages within deprived settlements in the major urban areas,[5] as this is where new investments, and upgrades of existing infrastructure, will be most demanded and needed in the near future.

While Apartheid officially ended with the country's first democratic elections of April 1994, it has left the country with serious inequalities along racial lines in the access to infrastructure services. To use the analogy of Wilson and Ramphele (1989): the scaffolding which built the structures of Apartheid has been removed, but the building still stands firm, meaning that the inequitable economic structure still remains firmly entrenched. Not only is South Africa's distribution of income one of the most unequal in the world, with a Gini-coefficient of 0.66 (Wilson and Ramphele 1989: p.18), but access to basic services such as water, sanitation, electricity, health and education is also highly unequal. An important objective for the government is to address this inequality and implement policies to correct it, and to this end it has designed and begun implementing its Reconstruction and Development Program (RDP 1995, South Africa 1994b). The analysis here will draw mostly on the SALDRU (1994) household survey, the "Municipal Infrastructure and Investment Framework (MIIF)" (South Africa 1995a,b) and the "Urban Infrastructure and Investment Programme" (South Africa 1994a).

A. Population Estimates

In July 1995, South Africa's population was estimated at about 40 million people (CSS 1997, South Africa 1995a,b). Of this, 76.1% are African, 2.6% are Indian, 8.5% are Colored, and 12.8% are White. The urban sector accounts for 65 percent of the population, and produces over 80 % of GDP (South Africa 1995a). Of the 26 million urban inhabitants, the four major metropolitan areas account for 14.8 million people or 37% of the total urban population (South Africa 1994a). The SALDRU (1994)

[5] The four major urban areas are Cape Town, Witwatersrand (greater Johannesburg), Durban, and Port Elizabeth.

national household survey estimated the total population in mid-1993 at about 38.1 million people, and projections based on the survey results supported this number. Assuming a population growth of about 3% per annum, as the South Africa (1994a and 1995a) reports do, produces a figure of about 40.4 million people for the mid-1995 population. Using the correct figure for the population (or as close as possible), has important consequences not only for the cost estimates of the MIIF, but also for the calculation of benefits in project appraisals. Special attention will have to be paid to the urban areas, not only because they contain the bulk of the population, but also due to their significant contribution to GDP.

Until the end of the 1980s the government controlled urban population growth by prohibiting the migration of Africans from rural to urban areas, but with the breakdown of Apartheid and the abolition of pass laws the influx of Africans into urban areas increased at very high rates. Since 1990 South Africa's major metropolitan areas have been experiencing very rapid urbanization rates. Besides the lifting of migration controls in 1986, the influx of people was exacerbated by the severe economic recession of the late 1980s, and the drought and subsequent decline in agricultural output and employment in the early 1990s. People migrated to the cities seeking economic opportunities, and informal squatter settlements emerged almost overnight, while existing ones expanded rapidly. Recently established squatter areas need infrastructure services, which the government will have difficulty financing, at least in the immediate future. The number of urban dwellers with deficient infrastructure service levels is estimated to be about 67% or 9.9 million people (South Africa 1994a).

B. Assessing the Backlog in Infrastructure Service Delivery

A lack of infrastructure services poses a constraint on economic growth and also adversely impacts the welfare of the population which has limited or no access to infrastructure services. The spatial patterns of South Africa's cities have prevented firms from taking advantage of the scale and agglomeration economies that generally characterize urban settlements (World Bank 1993, Krugman 1991), and the cost of such spatial distortion has not been trivial, as can be seen from the lack of services

and employment opportunities for the black population. In fact, these spatial distortions may have contributed largely to the economy's secular decline, which hastened the fall of Apartheid (South Africa 1994a).

One particular result of the Apartheid city is that it imposes prohibitively high transportation costs on the poor black population located at the periphery of the city, who must commute to the city center and other distant areas where jobs are located. These transportation costs not only reduce disposable income, but also raise the cost of a job search, making it expensive. Table 3.1 compares average travel time and cost of a one-way fare between place of residence and employment.

These travel times and costs, and access to infrastructure services, are a result of the peculiar and racially motivated manner in which South African cities were designed and allowed to develop. Economic activities were located in or close to the city center or to white neighborhoods, while other population groups were located (sometimes forcibly relocated) to the periphery of the cities, usually far away from economic activities. These settlements were generally low-income in nature, had mediocre infrastructure services, and had inadequate modes of public transportation to the city center and other areas of employment.

Table 3.1: Average Time and Cost of Travel

	Total Pop	African	Colored	Indian	White
All S.A. (Time mins.)	36	40	34	49	24
Metropolitan	41	52	43	51	28
Urban	31	38	27	47	17
Rural	33	34	7	16*	17
All S.A. (Cost Rand)	3.70	2.90	3.70	5.60	6.40

Source: SALDRU (1994)
* Sample size too small for valid conclusion

Average travel times and costs have a racial component which reflects distance from potential job markets and accessibility to modes of transportation. Table 3.2 breaks down transportation by mode,

which varies by race, with African and Colored groups using taxis (or minibuses) and walking, while Whites and Indians primarily use private cars.

Combining travel modes with travel times and costs points to the fact that lower income individuals have a difficult, and relatively more expensive commute in terms of total income than those with higher incomes who make greater use of private transportation. It is far easier to drive for one hour than it is to walk for one or two hours to work. From a utilitarian perspective, easing the commuting constraint by improving access to public transportation will increase the welfare of low income individuals who are more inclined to use the public transportation system.

Table 3.2: Modes of Transportation to/from Work by Race (Percent)

Race	Bus	Taxi	Train	Bicycle	Car	Walk	Other	Total
African	12.8	32.0	5.6	1.1	8.1	39.9	0.3	100.0
Colored	6.0	26.4	13.0	1.3	25.7	27.5	0.0	100.0
Indian	16.4	6.4	0.3	0.3	67.7	8.9	0.0	100.0
White	5.1	0.4	1.8	1.2	82.0	8.6	1.0	100.0
All	10.4	23.2	5.5	1.1	29.2	30.2	0.4	100.0

Source: SALDRU (1994)

Public transportation in the Black areas is generally lacking, though this gap has to some extent been filled by a relatively efficient and competitive taxi/minibus service to the townships. The use of public buses vis-à-vis other modes of transportation is relatively low due partly to the significant lack of bus service to low-income, especially squatter areas. The lack of public transportation is also problematic in the sense that nationally over 30% percent of individuals in the economically active age group are unemployed. Table 3.3 provides data on unemployment by race and broken down by urban, rural and metropolitan area.

Table 3.3: Population (percent), and Unemployment Rates

	All S.A.	Metro	Urban	Rural	African	Colored	Indian	White
Population	100.0	26.1	20.5	53.3	76.1	2.60	8.5	12.8
Unemployment rate	12.9	13.1	11.3	13.7	16.0	15.2	7.8	3.3
Including discouraged	30.1	21.5	25.7	40.0	38.5	20.9	11.3	4.50

Source: SALDRU (1994)

The structure of cities affects the workings of urban land and housing markets in significant ways, and it also imposes serious constraints on the functioning of the labor market. While whole-scale rezoning may not be feasible, what is required is zoning which allows the establishment of commercial activities within and close to squatter areas. Such a policy will contribute to formalizing what is a very large and economically important informal sector. The informal sector has been estimated to be anywhere from 20% to 40% of GDP (Fallon 1992 and CSS 1990). To this end the government may also wish to create incentives to encourage economic activities to locate closer to the low income areas. Improved economic opportunities and job creation will also have important effects on the willingness and ability to pay for infrastructure services. The analysis thus far points to a situation where there are rapidly growing urban squatter settlements which are not serviced, further complicated by the fact that unemployment is rampant in these areas, thereby making potential cost-recovery very difficult.

A major constraint to the growth of commercial areas in deprived settlements is an often ignored input into the production process, namely electricity. No data is available on the constraint this poses to commercial enterprises wishing to locate in or near deprived settlements, but there is some data on household access to electricity, which is indicative of the lack of access for low income groups. Table 3.4 shows the availability of electricity from the national grid for the various population groups. These figures are illustrative of inequalities which exist in a country where resources are not necessarily as scarce as they appear to be. This is perhaps most poignantly stated by Wilson and Ramphele (1989: p.44) who observe that:

"...group(s) of elderly black women, each carrying home on her head a load of firewood weighing up to 50 kg, passing underneath the high-tension cables that carry the electric energy....of the Republic. South Africa produces 60 per cent of the electricity in the entire continent yet almost two-thirds of the total population (and approximately 80 per cent of all Africans) within the country do not have access to that energy for their household requirements. Even in major cities whole townships are still erected without provision for electricity being made."

Table 3.4: Access to Electricity from National Grid by Race (Percent)

	Total Pop	African	Colored	Indian	White
All S.A.	53.6	36.5	86.2	100.0	99.8
Metropolitan	84.5	66.7	95.7	100.0	100.0
Urban	64.0	42.3	75.9	100.0	99.6
Rural	28.4	25.6	71.4	100.0*	98.5

Source: SALDRU (1994)
* Sample size too small for valid conclusion

The deficiency of electricity means that individuals have to use other sources -- such as wood and fossil fuels -- for energy, and candles for light. The cost of non-electric energy sources in terms of money, and also time spent collecting these energy sources, far outweighs the cost of supplying individual households with electricity. Granted, of course, the cost of connecting to the electricity grid may be prohibitively expensive. However, as with water and sanitation, the negative externalities associated with non-electric sources, and positive externalities and productivity effects which would result from providing the infrastructure, imply that some form of government assistance beyond the local authority may be called for. Through the MIIF the government has identified access to electricity supply as a priority area, and is seeking to provide access to electricity to over 70% of all households by the year 2,000 (South Africa 1995a: p.21).

Another factor which would certainly affect the decision of industrial firms to locate in any area is access to an adequate water supply. Again no detailed data is available on the constraint this variable poses in the decision of industrial location, or the effects it may have on the welfare of the local population, although access by households can be indicative of the water shortage in certain areas and communities. Tables 3.5 shows access to water (by source) disaggregated by population group. Except

for Africans, all other groups have high degrees of access to piped water, either internal home connection or piped yard tap.

Table 3.5: Access to Sources of Water by Race (Percent)

Water Source	All S.A.	African	Colored	Indian	White
Piped water-internal	81.4	17.5	78.9	99.2	99.7
Piped water-yard tap	11.9	25.8	16.5	0.8	0.2
Piped water-public kiosk	6.3	23.8	3.0	n.a.	0.1
Other	0.5	32.9	1.7	n.a.	n.a.
Total	100.0	100.0	100.0	100.0	100.0

Source: SALDRU (1994)
n.a. = not available

The African population group obtains 33% of their water from other sources, presumably this consists mostly of fetching water from natural sources. This group is also the only one to obtain water from public kiosks; 24% of the SALDRU (1994) survey participants said they obtained water in this manner, a number which is negligible for other groups as Table 3.5 shows. Of the 24% of Africans who obtained water from public kiosks, 21.5% obtained it from a free public tap, while only 2.5% bought water from a public tap.

Table 3.6 shows access to water by source for each province which contains major urban areas, and the regional disparities are striking. The low incidence of piped internal water in Gauteng[6] is probably due to the large concentration of squatter areas, which consist predominantly of informal housing with no formal access to water and sanitation services. The MIIF preference is that on-site household piped connections be encouraged as opposed to communal standpipes, which should only be considered where there is a low level of ability to pay (South Africa 1995a: p.22). The reason for this

[6] Gauteng is the new provincial name for the Pretoria-Witwatersrand-Vereeniging (PWV) region.

preference is due to health externalities and time savings which would free up individuals to pursue other economic activities.

Table 3.6: Access to Sources of Water by Province (Percent)

Water Source	All S.A.	W. Cape	Gauteng	E. Cape	KwaZulu
Piped water-internal	39.4	81.4	61.5	18.8	37.6
Piped water-yard tap	19.7	11.9	33.0	12.2	8.1
Piped water-public kiosk	17.3	6.3	5.2	20.0	16.7
Other	23.0	0.5	0.4	49.1	37.6
Total	100.0	100.0	100.0	100.0	100.0

Source: SALDRU (1994)

Related to the issue of water is access to sanitation services, particularly because a large percentage of water consumed becomes waste. Table 3.7 shows access to sanitation services, specifically toilets, broken down by metropolitan areas within four provinces.

Table 3.7: Access to Sanitation (toilets) by Metropolitan Area (Percent)

	All S.A.	W. Cape	Gauteng	E. Cape	KwaZulu
Flush toilet	83.0	64.7	88.0	76.1	69.2
Improved Pit Latrine	0.6	n.a	0.8	n.a	n.a
Other Pit Latrine	6.4	n.a	5.4	n.a	30.8
Bucket toilet	6.9	30.3	2.2	23.9	n.a
Other toilet	1.5	n.a	2.0	n.a	n.a
None	1.7	5.0	1.6	n.a	n.a

Source: SALDRU (1994)
n.a. = not available

From Table 3.7 it appears that most of the population in metropolitan areas (83%) has access to flush toilets, but it does not inform as to the need of rural areas and deprived urban (including metropolitan) settlements, which is where investments into sanitation infrastructure will most likely be required.

Unfortunately, the SALDRU (1994) survey data does not detail access to various types of toilets by racial group, although it does have aggregate data by province. SALDRU (1994) does contain data for Africans broken down by rural and urban areas, as shown in Table 3.8. The data in Table 3.8 is suggestive of the backlog in sanitation, in the sense that it is most likely Africans located in the deprived settlements who do not have access to sanitation services. Apartheid policies were to treat African urban settlements as temporary, and not to invest into the infrastructure needs of this group (Manche 1994).

Table 3.8: Access to Sanitation (toilets) by Race (Percent)

	All S.A.	African			Colored	Indian	White
		All	Urban	Rural			
Flush toilet	83.0	34.2	55.9	13.1	89.0	100*	99.8
Improved Pit Latrine	0.6	1.6	2.0	1.8	n.a	n.a	n.a
Other Pit Latrine	6.4	41.2	13.3	59.7	n.a	n.a	n.a
Bucket toilet	6.9	6.5	24.5	1.4	n.a	n.a	n.a
Other toilet	1.5	0.5	0.6	0.1	n.a	n.a	n.a
None	1.7	16.0	3.7	23.9	n.a	n.a	n.a

Source: SALDRU (1994)
n.a. = not available
* Sample size too small for valid conclusion

The percentage of all Africans with access to full flush toilets is only 34%, while it is 89% for Coloreds and 100% for Indians and Whites. For urban Africans this figure is higher at 56%, whereas it is very low at 13% for rural Africans.

The analysis thus far has shown the backlog for the four different race groups and also showed disparities across the major metropolitan areas and the provinces which contain these metropolitan areas. The MIIF quantifies the backlog for the most deprived areas within the four major metropolitan areas as these are the areas where the most investments required for addressing the backlog in infrastructure services will have to occur.

Table 3.9 shows the number of people who live in deprived (low-income) settlements in the four major metropolitan areas. All the figures are for 1992, and the infrastructure services covered are water, sanitation, roads, storm drainage, and electricity.

Table 3.9: Number of People in Deprived Settlements and Service Levels, 1992

	Cape Town	Witwatersrand	Port Elizabeth	Durban	Total	% total
Informal						
Unserviced	220,095	210,720	84,002	1,239,484	1,754,301	13.7
Partially Serviced	0	149,960	68,740	18,912	237,612	1.9
Formal						
Partially Serviced	172,225	763,700	464,571	195,983	1,596,479	12.5
Fully Serviced	443,400	3,456,830	201,453	916,081	5,017,764	39.2
Deprived Areas	835,720	4,581,210	818,766	2,370,460	8,606,156	67.2
Other Metropolitan	1,421,280	1,546,800	265,689	962,672	4,196,441	32.8
Total Metropolitan	2,257,000	6,128,010	1,084,455	3,333,132	12,802,597	100.0

Source : South Africa (1994a), South Africa (1995a,b)

Approximately one-fifth of South Africa's population lives in deprived settlements. Table 3.9 shows that about 67% of residents in the four major metropolitan areas live in deprived low-income settlements, with 14% living in informal settlements with no infrastructure services, and only 39% of residents in deprived settlements are fully serviced.

Table 3.11 quantifies access to various levels of infrastructure services in the deprived settlements of the four major metropolitan areas, and gives a more detailed breakdown of access to specific infrastructure services. The levels of service provision are defined in Table 3.10.[7]

[7] These definitions are also used by the World Bank and South Africa for calculating the costs of infrastructure service provision.

Table 3.10: Infrastructure Levels of Service

Service	Minimum	Basic	Intermediate	Full
Water	communal standpipe	communal standpipe within 250m walk	yard tap or tank	house connection
Sanitation	buckets	on site, e.g. VIP	simple water-borne	full water-borne
Roads	unsurfaced tracks	graded with gravel	graded minor and paved connector roads, no curbs	paved with curbs
Storm drains	none	open drains	open drains	piped drains
Electricity	none	streetlights, perhaps 5 amps	15-30 amps, pre-paid meters	60 amps house connections

Source: South Africa (1995b)

The 1992 population figures were projected to mid-1995 by the MIIF assuming that the population will grow at 3% per annum. The projected population figures were then used to calculate the costs of addressing the infrastructure backlog. Delineating between minimum, basic, intermediate and full levels of service allows the policy-maker to see not only how much it will cost to upgrade from existing levels of service, but also how much it will cost to provide each level should a community and its representative local government decide on a particular level of service (LOS). The decision of service level will be based on ability to access finance, either through grants or loans, and the ability and willingness of the community to pay for a given service level.

If the backlog in infrastructure provision is defined as those not enjoying the full level of service, then the full level of service can be thought of as defining the upper bound of the infrastructure backlog for a given service (Jackson 1996a). Likewise the backlog for lower levels of service can be thought of in a similar manner, i.e. as those with less than that particular level of service. Those below the minimum level of service would thus define the lower bound of the backlog.

Table 3.11: Access to Infrastructure Services in Deprived Settlements, 1992 (Number of People)

	Cape Town	Witwatersrand	Port Elizabeth	Durban	Total	% total
Water						
Minimum	17,235	239,780	77,930	1,243,284	1,578,229	12.3
Basic	202,860	1,355,972	33,747	137,367	1,729,946	13.5
Intermediate	129,625	388,200	44,251	83,328	645,405	5.00
Full	486,000	2,597,258	662,838	906,481	4,652,577	36.2
Sanitation						
Minimum	220,095	291,780	111,677	1,245,444	1,868,996	14.6
Basic	73,200	1,582,472	0	135,207	1,790,879	13.9
Intermediate	56,425	153,200	104,111	85,709	399,446	3.10
Full	486,000	2,553,758	602,978	904,100	4,546,836	35.4
Storm Drainage						
Minimum	220,095	457,280	110,440	1,240,844	2,028,659	15.8
Basic	0	1,540,972	47,787	32,967	1,621,726	12.6
Intermediate	85,525	1,744,249	444,211	255,309	2,529,295	19.7
Full	530,100	838,709	216,328	841,340	2,426,477	18.9
Roads						
Minimum	220,095	319,380	58,972	1,239,444	1,837,891	14.3
Basic	0	1,492,872	86,095	24,215	1,603,182	12.5
Intermediate	56,425	1,882,866	457,371	277,701	2,674,364	20.8
Full	559,200	886,092	216,328	829,100	2,490,720	19.4
Electricity						
Minimum	220,095	349,640	195,077	1,147,430	1,912,242	14.9
Basic	115,800	1,363,612	395,240	129,395	2,004,047	15.6
Intermediate	59,352	661,515	27,121	180,309	928,271	7.20
Full	440,500	2,206,443	201,328	913,326	3,761,597	29.3
Population						
Deprived Areas	835,720	4,581,210	818,766	2,370,460	8,606,156	67.2
Metropolitan	2,257,000	6,128,010	1,084,455	3,333,132	12,802,597	100.0

Source : South Africa (1994a), South Africa (1995a,b)

Chapter IV. Cost of Infrastructure Provision

Given the backlogs shown in the previous chapter, the South African Government (South Africa 1994a and 1995b) has calculated the cost of upgrading existing infrastructure to basic, intermediate and full levels of service, and the cost of providing infrastructure services to new settlements (greenfield developments). The cost of *upgrading* urban infrastructure[8] to the full level of service (LOS) was estimated to be Rand 25,918 Million in 1995, which amounts to 5.1% of GDP, with bulk infrastructure accounting for 28% of total costs in Port Elizabeth, 31% in Durban, 40% in Witwatersrand, and 65% in Cape Town (South Africa 1995b).[9] This produces a cost per beneficiary for upgrading of: R946 for basic services, and R1,964 for full services. The average annual household per capita income was calculated from the SALDRU (1994) survey to be R8,520 in mid-1993, and the Reserve Bank has GDP per capita for 1993 at R9,196. The World Bank (1995) shows South Africa in 1993 to have a GNP per capita of US$2,980 which, converted at that year's exchange rate, produces a GNP per capita of R9,735. Table 4.1 shows average annual household per capita income data disaggregated by race and province containing a major metropolitan area. The income disparities suggest that those who need the infrastructure services the most will least likely be able to afford them. Upgrading to the full infrastructure level of service is equivalent to about half the annual household per capita income[10] of Africans, while the basic level of service will be roughly a quarter of their income. It therefore seems unlikely that even the basic level of infrastructure will be affordable to the poorest groups of the population, unless they are allowed to borrow, via their local authorities or governments, or receive grants from the central government to help finance new infrastructure services.

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[8] The infrastructure services covered are water, sanitation, roads, storm drainage, and electricity. The needs for combinations of these services will, of course, vary across communities, thereby altering the costs.

[9] These estimates are in 1995 Rands and based on 1995 population projections.

[10] These figures are consistent with real income growth of 2 to 3% p.a. between mid-1993 and end-1995.

Table 4.1: Average Annual Household Per Capita Income by Race and Province, 1993 (Rand)

	All S.A.	African	Colored	Indian	White
W. Cape	9,840	4,968	6,396	19,752*	26,064
E. Cape	2,568	2,220	3,624	n.a.	19,428
KwaZulu	3,600	2,520	9,264	10,896	26,976
Gauteng	11,796	6,360	11,412	17,328	30,900
All S.A.	8,520	3,864	6,444	12,060	28,584

Source: SALDRU (1994)
n.a. = not available
* Sample size too small for valid conclusion

A more detailed breakdown of upgrading costs by service level is given in Table 4.2. The total cost of infrastructure provision includes the costs for land, institutional development, design, and price and physical contingencies.

Table 4.2: Estimated Cost of Urban Infrastructure Service Provision (Million Rand, 1995 prices)

	Basic	Intermediate	Full
Metropolitan Cities			
Upgrading	1,929	3,810	10,957
New Sites	568	980	1,498
Bulk Infrastructure	3,087	3,087	3,087
Total Metropolitan	6,680	8,973	16,624
All Urban Areas			
Upgrading	5,986	10,088	25,918
New Sites	1,125	1,941	2,940
Bulk Infrastructure	7,215	7,215	7,215
Total All Urban	16,067	20,985	
Total Cost	21,249	27,753	50,009

Source: South Africa (1994a), South Africa (1995a,b)

The total cost of infrastructure *upgrading and bulk/new infrastructure (greenfield developments)* delivery for the full level of services is expected to be R50 Billion (US$13.8bn),[11] which amounts to 10.3% of GDP. This is consistent with South Africa (1995a: p.36) which estimates that the backlog in infrastructure is approximately 5-9 of GDP depending on level of service delivery. This figure for upgrading and providing new infrastructure amounted to R21bn (US$5.8bn) or 4.4% of GDP for basic service levels, and R27bn (US$7.4bn) or 5.5% of GDP for intermediate service levels. Financial resources thus represent the most significant binding constraints on infrastructure investments.

Preliminary estimates by the World Bank (1994b) suggest that a real growth rate of 3% per annum will allow the macroeconomy to sustain annual public investment of 1.7% of GDP. Given the cost estimates of R25bn for upgrading and R50bn for upgrading and new infrastructure to the full service levels, it would be impossible, in both financial and practical implementation terms, to eliminate the backlog in one year. These costs are based on existing need to eliminate the backlog and do not make provisions for future population growth (South Africa 1995a). If anticipated future demand is included the cost of infrastructure provision would increase to R44-89bn, with basic and full levels determining the lower and upper bounds. Even meeting the basic level of services in one year would require an expenditure (or investment) equal to about 4.4% of GDP. Phased over five years, investments to meet the intermediate standard of services in urban infrastructure would represent 0.68% of GDP per annum and 40% of aggregate public investment, and phased over eight years it would account for 0.42% of GDP and 25% of public investment (World Bank 1994b); calculations which are consistent with macroeconomic constraints. While Ahmad (1994) does not spell out the model he uses to calculate these macroeconomic consistent infrastructure expenditures, it is safe to assume that he utilizes the macro-econometric model developed in Fallon and Pereira da Silva (1994). The figures, though, are indicative of the magnitude of the problem. Various government reports (South Africa 1994a, 1995a, 1995b, 1996) propose that the urban infrastructure program be implemented over a period of ten years, and estimates

[11] The 1995 exchange rate was 3.627 Rand per US Dollar.

that given favorable economic conditions[12] a capital investment program of R60-70bn would be feasible for the five services outlined above.

A. *Shortcomings of the MIIF Cost Calculations*

The analyses of the MIIF and the various World Bank studies do not consider technologies other than those described in Table 3.10. For example, sanitation services such as the condominial type sewer system could be an option. Experience in Brazil has shown that condominial sewers are much cheaper than traditional systems in both installation and maintenance costs (Watson 1995). In fact, with all its emphasis on financial assessments, it is surprising that none of the numerous World Bank reports even mention the condominial sewer system as a viable option for South African squatter settlements. It may be the case that the condominial system may not be feasible given the political-economy of South Africa, where the expectation may be that the government should provide high levels of service.

The MIIF does point out that the marginal cost of higher levels of sanitation services, such as full waterborne sewerage, significantly outweighs the marginal economic benefit as compared to low cost alternatives, such as on-site systems, where marginal benefits will exceed the marginal costs (South Africa 1995: p.22). Thus, at the margin, the ratio of benefits to costs of money spent on low levels of sewerage is positive and much higher than that of full service levels, which may have very low or even negative economic returns. In terms of maximizing economic benefits it could be argued that resources should be allocated in such a way that the marginal benefit of receiving a service should equal the marginal cost of providing it (Zerbe and Dively 1994). In the case of infrastructure projects, the level of service chosen should be one that minimizes the discrepancy between marginal benefits and costs, with benefits exceeding costs, as it is unlikely, given the "lumpy" nature of the investment, that the two can be equated.

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[12] This means growth of real GDP no less than 3% p.a. with low and stable inflation rates.

Another shortcoming in the cost estimates by both the World Bank and the South African government is that they do not detail the materials (PVC, concrete, etc.) to be used in the case of water and sanitation infrastructure projects, since these services are more amenable than others to different types of technologies. Nor is it clear exactly how the costs are calculated, what the specifications of the inputs are, such as water and sewerage pipe diameters, and how costs change with various pipe sizes and materials. Other infrastructure services will, of course, use other variables, and in the case of roads, for example, road width would be considered. Issues of materials used for inputs and design layout are discussed in Kalbermatten, et al (1980) and Lauria (1994). It is also unclear how the special interests of groups and other political-economy issues, as outlined in Angel (1985), are taken into account, if at all, and how these variables will affect infrastructure costs.

A model which may be a very useful tool of analysis, but which has not yet been applied to the South African situation, is the Bertaud model (Bertaud et al 1988). This is an integrated model which can simulate the effect changes in material costs, design layout, and other relevant variables are likely to have on project costs. It also provides an integrated framework which allows the planner to incorporate other costs, such as land, housing, etc. As such, it can be perceived as a general equilibrium model for housing and infrastructure investment projects. Like any other model, the Bertaud model does have its shortcomings, but it nevertheless provides a useful and systematic way of simulating and assessing the effects changes in project design have on overall costs. The Development Bank of Southern Africa and the Water Resources Commission are in the process of developing a computer-based financial model to test infrastructure investment plans for their long-term feasibility (Jackson 1996 a,b). No details regarding the model or its structure are available at this time, but it differs from the Bertaud model, which may provide a more integrative approach, in the sense that it can be linked to other aspects of spatial planning, such as the development of land and housing markets.

Chapter V. Local Governments and Infrastructure Provision

The devolution of powers to local governments in South Africa as outlined in the constitution and various other documents and laws (such as the LGTA) seeks to encourage an "integrated planning approach" as suggested by the "Reconstruction and Development Programme". The RDP proposes a conceptual framework for meeting the country's dual objectives of rapid economic growth coupled with poverty eradication (RDP 1995, South Africa 1994b). The link between the RDP and the urban infrastructure delivery strategy (the MIIF) is apparent from their focus on basic needs, although the RDP is more comprehensive and the MIIF can be seen as a subset of the RDP. The need for strengthening local governments is also clear given that they are primarily responsible for meeting infrastructure needs and addressing the backlog in infrastructure service delivery to the poor.

A. Role of Local Government in MIIF

The constitution stipulates that local governments should provide services in an "equitable and sustainable" manner (section 155(4)) and ensure that priority in service delivery is given to meeting the "basic needs of the community" (section 153(a)). This is consistent with the principles put forth by the RDP (1994) in the sense that it seeks to secure a sustainable growth path which provides services in an efficient (cost-minimizing) manner while meeting objectives of equity and poverty alleviation.

In terms of the MIIF, local governments have to assume prime responsibility for the delivery of infrastructure services, and are to ensure that all costs are recovered locally in order to pay for such services. At the same time, infrastructure services should be provided in accordance with levels of affordability by local communities (South Africa 1996). Criteria of willingness to pay and affordability are to be given serious consideration by LGs as the central government wishes to avoid a system of long-term subsidization, especially of current expenditures. It is expected that LGs should be able to finance operations and maintenance (O&M) expenditures through local revenue generation, i.e. either through

local taxes or by collecting user fees, or both. As for capital expenditures, some grants/subsidies will be forthcoming from the central government, mostly to ensure that all LGs can at least provide a basic level of service to their communities. On the whole, though, LGs are expected to borrow to finance infrastructure investment and to repay loans from own-revenue sources.

B. *Local Government Revenue and Expenditure*

The ability of local governments to generate revenue and improve expenditure allocations is important as it will influence their success in meeting infrastructure needs. It will also provide an indication as to the types of policies that will be required to strengthen LGs and their supporting institutions which are responsible for service delivery.

It is difficult to draw comparisons between pre- and post-Apartheid local government revenue and expenditure shares in the total government because the definition of what constitutes a local government has changed dramatically, as is evident from Chapter II. Also, prior to 1994, official statistics only reported numbers for the WLAs (which included MCs), and data for BLAs (RSCs and the homelands) were reported separately and were almost always unreliable.

The fact that BLAs relied heavily on grant transfers from the central government will serve to distort the reality as to the importance of local governments before 1994. WLAs had various sources of revenue generation, with service fees and property taxes playing very important roles. As Africans were not allowed to own property in Apartheid urban South Africa, property taxes as a source of revenue were not available to BLAs. The lack of service provision in African areas also meant that revenue from service (user) fees was small or absent. The revenue shortage was exacerbated by the rent and service fee boycotts in townships as forms of protest against what were considered illegitimate BLAs.

It is only since 1994, with the amalgamation of the LAs of all population groups, that a more accurate picture of the share of local government in the economy can be attained. This is especially true

since the new LAs are increasingly encouraged to raise their own revenue, while decreasing their reliance on grant transfers from higher tiers of government.

Local governments represent about 10-14 percent of total government expenditure, depending on whether transfers from higher tiers of government are included. This indicates a reasonable degree of decentralization with regard to expenditure. A committee known as KIFVSA investigated South Africa's intergovernmental fiscal relations in the early 1990s (South Africa 1992). It projected that under a scenario of maximum devolution, local government expenditure as a share of total government expenditure would increase from about 11%[13] to roughly 40%. On the other hand, the share of central government expenditure in total government expenditure could potentially decrease from 60% to 45%, and for provincial governments the corresponding figure would go from 29% to 16%. The figures are summarized in Table 5.1.

Table 5.1: Revenue and Expenditure Shares of Government Tiers (Percent)

	Expenditure			Revenue			
	1992	1996*	Devolved	1992	1996*	Devolved	Devolved with Revenue Sharing
Local	10.9	10.6	39.5	7.9	12.0	11.5	18.0
Provincial	28.5	41.2	15.9	9.4	46.4	12.9	21.6
Central	60.6	n.a.	44.6	82.7	n.a.	75.6	60.5

Source: South Africa (1992) and South African Reserve Bank Quarterly Bulletin
n.a. = not available
* As percent of General Government

The KIFVSA committee also found that revenue shares of local governments in a fully devolved system would increase from 8% to 11.5%, and this figure rose to 18% once revenue sharing and grant transfers were taken into consideration. The revenue accruing to provincial governments would increase, whereas the revenue share of the central government would decrease. It should be noted, though, that the

[13] This figure is for 1992, but calculations for 1996 places it at about the same level. i.e. 11%.

figures for provincial governments are not very reliable, as can be seen by comparing 1996 to 1992 data. The reason for this is that the 1996 data is for the newly defined provinces which include the homelands and SGTs; these were excluded prior to 1994.

The data shows that expenditures of local governments would increase by much more than revenue as a share of total government, implying that the revenue bases of local governments are very limited, especially in the short run; that is, local tax bases are limited and probably not very buoyant in yield. The implication is that in order to finance infrastructure services LGs will have to tap into other sources of finance, such as loans and/or grants, to overcome their budgetary constraints. Table 5.2 breaks down the revenue sources of local and provincial governments.

Table 5.2: Income of Local Governments and Provincial Governments (Percent of Total)

	1989	1990	1991	1992	1993	1994	1995	1996
Local Governments								
Total Revenue & Grants	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Revenue	0.81	0.82	0.82	0.82	0.80	0.80	0.81	0.87
Tax Revenue	0.26	0.30	0.30	0.32	0.34	0.39	0.38	0.39
Non-Tax Revenue	0.50	0.50	0.50	0.48	0.45	0.40	0.42	0.46
Capital Revenue	0.05	0.02	0.02	0.02	0.01	0.02	0.02	0.02
Grants	0.19	0.18	0.18	0.18	0.20	0.20	0.19	0.13
Provincial Governments								
Total Revenue & Grants	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Revenue	0.16	0.14	0.16	0.16	0.15	0.15	0.13	0.07
Tax Revenue	0.07	0.08	0.08	0.08	0.07	0.09	0.07	0.01
Non-Tax Revenue	0.09	0.07	0.09	0.08	0.08	0.05	0.06	0.06
Grants	0.84	0.86	0.84	0.84	0.85	0.85	0.87	0.93

Source: South African Reserve Bank Quarterly Bulletin

Table 5.2 shows that provincial governments are much more dependent on grants transfers than are local governments. Grants historically constituted slightly less than 20% of the income of local governments, and were placed at 13% in 1996. For provincial governments, grant allocation in the past contributed about 85% to their total income, and was over 90% in 1996. The projected grant allocation

to the provinces is estimated to be 95% for the 1997 fiscal year (Ministry of Finance 1997). Taxes are important sources of revenues for local governments, but are a small part of provincial revenues. Non-tax revenues, which include user fees and service charges, exhibit similar patterns. In fact, tax revenues for LGs have increased from 26% in 1989 to about 40% in 1996, whereas non-tax revenues have taken a slight fall over the same period. Tax revenues for provincial governments have fallen from 7% in 1989 to a negligible 1% in 1996, and non-tax revenues have also declined from 9% in 1989 to 6% in 1996.

Table 5.3: Expenditure of Local and Provincial Governments (Percent of Total)

	1989	1990	1991	1992	1993	1994	1995	1996
Local Governments								
Total Expenditure	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Current Expenditure	0.57	0.68	0.69	0.63	0.66	0.67	0.68	0.72
Capital Expenditure	0.43	0.32	0.31	0.37	0.34	0.33	0.32	0.28
Provincial Governments								
Total Expenditure	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Current Expenditure	0.86	0.87	0.89	0.92	0.94	0.92	0.93	0.93
Capital Expenditure	0.14	0.13	0.11	0.08	0.06	0.08	0.07	0.07

Source: South African Reserve Bank Quarterly Bulletin

Table 5.3 breaks down local and provincial government expenditure into its current and capital components, showing the percent of each expenditure item in the particular tier of government's total expenditure. Current expenditures form a larger share of provincial government expenditure than for those of local governments. Local governments allocate on the order of a third of their expenditures to capital expenditure, whereas provincial governments have been allocating less than 10% since 1992. The data in Tables 5.2 and 5.3 point to a system where local governments, which are responsible for infrastructure service delivery, have greater revenue bases than provincial governments and where LGs also rely less on grant transfers from the central authorities.

C. *Short Run Infrastructure Delivery Programs*

The above analysis suggests a situation in which local governments will not be able to raise enough revenue to cover expenditures, especially if large investments in infrastructure are needed. This budgetary constraint can in part be overcome by borrowing money from the private markets, thereby allowing LGs to allocate the consumption and expenditure patterns of their constituents intertemporally. However, the ability of different LGs to borrow will vary widely depending on their fiscal strength and the income of the communities they serve. While different LGs will borrow from different sources, some form of grant support will be required to meet objectives of equity, if not to kick-start urban infrastructure investment. In order to get the urban infrastructure investment program underway, and to avoid waiting until all long-term issues regarding infrastructure service delivery have been sorted out, the central government has begun to initiate some programs. These are mostly in the form of subsidies and grant transfers to infrastructure investment projects in targeted areas.

The major initiatives started and implemented by the central government to make funds available to LGs are: the Masakhane Campaign, the Municipal Infrastructure Extension Program (MIEP), Special Integrated (Presidential) Projects (SIPs), and the Bulk and Connector Infrastructure Grant Program (BCIG). A brief description of each program is provided below.

The Masakhane Campaign[14] was launched in February 1995 to address issues of broad community development. Two of its foci are accelerated municipal service delivery, and ensuring that users pay for the services that they consume (South Africa 1996). LGs are responsible for implementing the campaign, and it stresses that communities be educated on issues such as LG revenue and expenditure patterns, the importance of paying for services, and the various levels of services and associated costs. A major objective of the program is to enhance the capacity of LAs to provide and

[14] Masakhane is a Nguni word meaning "let us build each other" (South Africa 1996).

administer housing and infrastructure services. The process was launched by the RDP Ministry and the Department of Housing with R850 million channeled to LAs through the MIEP.

Municipal Infrastructure Extension Program (MIEP) is located in the Department of Constitutional Development and is generally run by the RDP Office. The objective is to provide LAs and communities with expert support teams to aid them with the preparation of business plans when applying for funding from this program (South Africa 1995a). The expert support teams are usually from institutions such as the Development Bank of Southern Africa (DBSA) and/or private consultants.

Bulk and Connector Infrastructure Grant Program (BCIG) is located in the Department of Housing, and the RDP Office is responsible for technical oversight of the program. Using the same formula as the housing subsidy, funds are allocated to the provinces. The provinces in turn receive applications for infrastructure projects from LGs, and are responsible for allocating money to selected projects. As of mid-1996 this program was not yet implemented (DOF 1996).

Special Integrated (Presidential) Projects (SIPs) were announced by the president shortly after the new government came to power, and are intended to kick-start development in highly visible areas, focusing on violence-torn and crisis-ridden communities (South Africa 1996). These are once-off projects aimed at immediate delivery, and are intended to set precedents for service delivery and community participation. Funding allocations for SIPs are centrally determined based on perceived national priorities, unlike the previous three initiatives which are driven by LG proposals. DOF (1996) argues that relative to MIEPs, the SIPs have performed poorly, although it is not clear how success is measured, especially since the initiatives have different objectives.

In addition to these programs, the government has also begun to implement its *Housing Program* which targets subsidies to end-users rather than LGs, and seeks to sustain housing delivery at 350,000 units p.a. within five years (South Africa 1996). The subsidies vary by household income, with lower income households qualifying for greater subsidies. The housing subsidy is intended to be a once-off capital amount per household, with households given as much discretion as possible on how to spend the

subsidy (South Africa 1995a: p.60). The MIIF proposes a requirement that at least 40% of the housing subsidy be spent on infrastructure at site and project level if the MIIF is to be viable and sustainable (DOF 1996: p.6).

The DOF (1996: p.9) report highlighted the fact that double subsidization is emerging as an increasingly important problem, as the initiatives outlined above often overlap. For example, households receiving a housing subsidy, which are also located in a local government that is receiving project-level infrastructure subsidies/grants through the MIEP, benefit more than others where there are only one of these initiatives in place. Similar effects could occur in areas where there are overlaps between any of the other initiatives (such as MIEP and BCIG). There is a clear need to coordinate subsidy and grant allocation to ensure not only that resources are not wasted, but also that there is equity in the way funds are allocated to households and LGs. The current grant allocation system for infrastructure investment is poorly coordinated due to a lack of conscious design (DOF 1996).

The current system is short-term in nature and implementation problems such as these can perhaps be expected and tolerated. The national government needs to ensure that a system which seeks to have an efficient long-term infrastructure investment financing mechanism not suffer from the same drawbacks as current initiatives. What is needed is a system in which grants for infrastructure investment are linked to the ability of local governments to borrow and raise revenue through either cost-recovery or taxes. The next chapter will outline a methodology for thinking about the manner in which grants and loans can be linked when financing capital expenditures for infrastructure projects.

Chapter VI. Grant-Loan Linkages and Infrastructure Investment Finance

The huge capital outlays associated with infrastructure projects, and the limits of local governments' current revenue, mean that these projects cannot be financed solely through the local tax base and user fees. Local governments will thus have to borrow money from outside sources, such as the private capital markets or development banks, and the issue then becomes how much money can be borrowed, for which projects, and what the terms of the loans should be.

Infrastructure projects have both equity and efficiency objectives and meeting them often requires using more than one financing method. The set of financing methods used will depend on the type of project and the individuals affected by the project. It is important to know which set of financing methods needs to be used in order to assess the costs and benefits to all affected groups, and thus of the project as a whole. In this chapter the vector financing method (VFM) is developed to enable the selection of financing alternatives for projects of varying size given the characteristics of the local government responsible for the project's implementation. The intent of this method is to explicitly link the use of intergovernmental grants and private loans in order to encourage equity while meeting efficiency criteria.

A. Intergovernmental Grants and Local Government Loan Sources

Intergovernmental grant transfers play a central role in all countries' fiscal policy (World Bank 1994a). Grants from central (or provincial) to local governments will play an important role in South Africa, not least because of the need to address the backlog in infrastructure services. Stability of LG expenditures requires that grant flows to LGs be predictable and transparent. A brief synopsis of the four main types of grant transfers, and their anticipated impacts, is given here.

First, grants may be conditional or unconditional. Conditional grants are given to LGs for expenditure on an assigned item/function specified by the higher tier of government.[15] The LG is committed to spend the grant money on a pre-assigned function, such as health, education, water, etc. The purpose of conditional grants is to alter relative prices, making the targeted service cheaper relative to other services. Unconditional grants are given to the recipient LG to spend in any manner it deems appropriate, and is thus tantamount to shifting the budget line of the LG parallel outwards, and hence has no effect on the relative prices of various services delivered by the LG.[16]

In addition to being conditional or unconditional, grants may also be lump-sum (block) or matching transfers. Block grants are fixed sums transferred to the recipient LG, and matching grants reward the recipient LG for additional money it raises or spends. Matching grants can also be tied to the amount of money LGs borrow. In terms of conventional theory, block grants can be thought of as shifting the budget line in a parallel fashion, while matching grants pivot the budget line, that is they alter relative prices as perceived by the LG. Four types of general grants can thus be distinguished, namely conditional and unconditional, which can be either matching or non-matching.

Unconditional block grants are used to allow lower tiers of government to share in central government tax revenues. This is to capture scale economies and efficiency effects (cost-minimizing) the central government has in collecting certain taxes, such as the income tax. Unconditional block transfers are to ensure that lower tiers of government have sufficient financial resources to pursue their constitutional assigned responsibilities (World Bank 1994a).

Unconditional matching grants are used to equalize fiscal (tax) capacity, usually across sub-national governments (provinces). The focus of these grants is on provincial equalization, and provinces with lower tax capacity receive greater sums (FFC 1995, 1996, Inman 1996, McClure 1994), but they may also be used to ensure fiscal fairness among taxpayers in different local governments.

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[15] The higher tier of government can be either the province or the center. Here it is assumed to be the center.

[16] For discussions on the effects of various grants using economic theory, see Shah (1994) and Schroeder (1988).

Conditional lump-sum (block) grants are intended to allow LGs (or provinces) to meet at least the basic needs of their residents. Targeted block grants can, in South Africa for example, be used to subsidize infrastructure investments up to the basic LOS, and hence to ensure that all LGs can provide their residents with at least the basic level of infrastructure services.

Conditional matching grants are best used for encouraging infrastructure investment and expenditures above the basic level, and could be used in a grant loan-linkage system. These grants should be used on projects with a demonstrated high rate of return (World Bank 1994a), and where externalities may result in the LG not investing in infrastructure to the degree required, or when they may not invest at all (Inman 1996). In the case of infrastructure investments, the grants to use in this category would be capital project grants, which are demand driven in the sense that they rely on the submission of proposals by LGs and feasibility studies. This builds on and is consistent with some of the government initiatives mentioned in the previous chapter. It is expected that project grants, while administratively more complex than block grants, will more likely result in productive infrastructure investments (Bahl and Linn 1992).

The public finance literature usually focuses on the effect which grants may have on the tax effort of the LG, and it is argued that grant systems should be structured so as to encourage local tax collection efforts and not dampen them (Bahl and Linn 1992, Smoke 1989). While effects on tax efforts are important, the concern here is with the impact grants may have on LGs' willingness to borrow from private sources.

Much less information is available on loan sources to LGs than grant allocation mechanisms, such as the ones outlined above. In South Africa, loans will be forthcoming from predominantly three sources: bond issues, commercial bank loans, and the Development Bank of Southern Africa (DBSA). Not much can be said about these loan sources, and this area requires much more research. The conditions of loans will vary between various types of projects and LGs. Bond issues will only be possible within the financially strong LGs, such as the major metropolitan areas, and mostly for projects

which are revenue generating. Commercial banks and long-term institutional investors, such as pension funds, may also choose to hold equity in municipal bond issues. This is the case in the recent R500m ten year bond issue by Infrastructure Investment Corp, trading as Inca, in which there were 23 investors "ranging from large institutions to small pension funds." (Hazelhurst 1997). DBSA loans will be of a concessionary nature, and will be to LGs which are considered "unacceptably high risks" by private financial markets (DBSA 1996). These will be the poorest LGs, most notably those in the former homelands and SGTs, but also the small town LGs.

B. *Rationale for Grant-Loan Linkages*

Infrastructure projects require large scale up-front investments. These fixed costs imply "front-end capital formations" which tend to strain even the most developed public finance systems of the industrialized nations, and even well-rated public utilities often have problems funding debt over long periods of time (Kirwam 1989). The limits of local government revenue generating capacity in the short run suggest that they will not be able to finance infrastructure investments in a "pay-as-you-go" manner, but will have to resort to borrowing from the private sector to meet investment needs. This makes good economic sense as it allows intertemporal allocation of the consumption of infrastructure services.[17] In addition, loans also impose fiscal discipline on LGs, thereby encouraging them to implement projects in an efficient[18] manner. Local government borrowing may facilitate long-term development goals by broadening and deepening capital markets, thereby allowing financial markets to serve as reliable and efficient conduits for future infrastructure investment finance (World Bank 1994c).

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[17] See Rothenberg (1992) for a general discussion on intertemporal substitution.

[18] Efficiency is defined as technical efficiency where services are provided at minimum average cost, and economic efficiency where the services delivered reflect the preferences of the users.

However, even when capital markets work fairly well, as is the case in South Africa,[19] certain local governments may not have access to loans, or they may not get loans in the amounts they need. Even if they have access to loans via a development bank, such as the DBSA, they may not be able to assume high levels of debt. This will be especially true in poorer LGs, but can also be the case if a project is to be implemented by a LA whose residents have low income levels, even if this LA is located within a financially strong LG. This may be the case, for example in metropolitan areas, such as Cape Town or Johannesburg, where there exist LAs with very low income communities.

In cases where access to capital markets, or high debt levels, pose a barrier to investing in infrastructure, use could be made of intergovernmental grant transfers. Grant transfers may create disincentives for LGs to mobilize their own resources. One way around this problem would be to link grant transfers to local revenue generation (Schroeder 1992). Such a policy, however, may create an open-ended grant transfer system and introduce uncertainties in the central government budget as it may not be sure how much local revenue will be generated, and thus how much money should be transferred to LGs. It may also create a system of continuous grant flows to LGs from the center, which will serve to limit the fiscal autonomy of LGs, thereby reducing the impacts of devolution.

What is needed is a system in which grant transfers are once-off and where LGs do not rely on them extensively in the long run. In terms of meeting both equity and efficiency objectives it would be prudent for the central authorities to provide once-off subsidies (grants) to assist with capital expenditures, but place the responsibility of current expenditures or operations and maintenance (O&M) costs with LGs. Such a system encourages local revenue generation through cost-recovery schemes, and in the case of non-revenue generating infrastructure, such as roads and storm drainage, it provides incentives for greater utilization of the local tax base. As it does not interfere with tariff structures or subsidize the interest at which LGs borrow, efficiency in resource allocation is not necessarily deterred.

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[19] South Africa is reported by the IFC (1996) as having a stock market capitalization of US$280.5 billion, which is the largest among emerging economies, followed by Malaysia with US$222.7 billion.

Incentives to over-invest are potentially removed as the interest rate at which LGs borrow reflects the true cost of capital, and the constraint to keep capacity within affordable limits is reinforced by the fact that most O&M costs have to be borne by local governments. Problems of subsidized interest and continuous grant allocations were pervasive in many Municipal Development Funds (MDFs), and often the distinction between grants and loans was blurred, with loans frequently being converted into grants (Ferguson 1993). This problem was partly due to the fact that grants and loans were being disbursed by the same entity.

In order to encourage investment in infrastructure services, grant transfers to LGs should be linked to more than just local revenue generating initiatives. Smoke (1996) proposes that intergovernmental grants should be linked to LG borrowing from the capital markets or development banks. Grants may enable LGs to borrow more money to finance higher levels of service which may not be feasible in the absence of grant transfers. Grants would thus serve to ensure that debt service is kept within reasonable and affordable limits, and used where local revenue may not be enough to cover loan payments in the absence of grants (Ichsan 1995). In cases where debt service may be reasonable, LGs may wish to use grants as leverage for securing better interest rates on loans. This could be especially useful in metropolitan areas where bond issues are plausible. Bond issues would generally allow the LG to obtain better interest rates than if the money were borrowed from a commercial bank. However, if there are many low income LAs, as is the case in the metropolitan areas, LGs may be limited in their ability to issue revenue bonds and may have to resort increasingly to issuing general obligation bonds, causing the tax base to be over-extended.[20] In cases such as these, LAs may qualify for grant transfers, but the LG may be financially strong enough to issue bonds or borrow through other avenues. Disparities within urban areas may justify grant transfers even to better-off LGs, especially if they have many poor LAs within their jurisdiction.

[20] Revenue bonds tie debt repayments to the revenue stream of a project, whereas general obligation bonds uses the tax base of the LG as collateral.

Table 6.1 below presents a typology of loan financing options which may be available for different types of LGs, as defined in Table 2.1, for the five infrastructure services listed in the MIIF. The loan financing options are indicative of what may be available to each LG for a given project, although loan financing options will vary depending on the LOS of the infrastructure, as will grant assistance.

Table 6.1: Typology of Loan Financing Options for Local Governments by Infrastructure

Service / *LG Type*	Water	Sanitation	Storm Drains	Roads	Electricity
Metropolitan	Bonds Commercial	Commercial	Commercial	Bonds Commercial	Bonds Commercial
Large Cities	Bonds Commercial	Commercial	Commercial	Commercial	Bonds Commercial
Medium Cities	Commercial DBSA Grants	DBSA	DBSA	DBSA	Commercial DBSA
Small Towns	DBSA	N/A	N/A	N/A	DBSA

N/A = Not Applicable

Table 6.1 illustrates loan funding sources which may be available for various LGs and for different projects. For example, a large metropolitan area, given its financial resources, may be able to issue revenue bonds in order to finance private household piped-water connections, or individual household electricity connections. Cost-recovery capacity for these services is high and the revenue collected from service delivery can act as collateral for the loan. The same is true for toll roads. Non-revenue generating services such as regular roads, storm-drainage, or sanitation services, may not lend themselves as easily to bond issues. The LG could issue general obligation bonds, which use the tax base as collateral. The LG may of course choose to use unconditional block grants as collateral, assuming that the bond issuing entity (or bond-holder) has recourse to such flows should the LG not be able to make scheduled loan repayments.

At the other extreme, the LGs of small towns will not be able to issue bonds, and their ability to borrow from commercial banks (or commercial bank consortia) will be very limited, if not an impossibility, especially for services which do not generate revenue. These LGs will rely mostly on grant transfers, and will seek concessionary loans from the DBSA. It is unlikely that these LGs will be able to invest much above the basic level of services, and if they could do so, it would be for electricity and perhaps water. For example, providing communal standpipes would generate no revenue, and would in any event allow the LG to qualify for a conditional block grant. It is in LGs which are neither strong enough to issue bonds nor weak enough to qualify for total grant assistance where a combination of grants and loans have to be used to facilitate infrastructure service delivery. Even so, it may be good practice to have even poor LGs (and LAs) borrow small amounts from the DBSA in order to create a "culture" of borrowing and debt management among all local governments. Experience with specialized infrastructure banks, such as the DBSA, has not been successful in all countries. An exception is Brazil's National Housing Bank (NHB) which has been fairly successful and is said to perform with remarkable efficiency (Azzad and Jacobs 1986). The NHB lends to the state (provincial) level, and has lent $6 billion over the last fifteen years for programs that have delivered water and sewerage systems to more than 60 million people.

C. *Vector Financing Method*

The vector financing method (VFM) developed here is based on a methodology designed by Rothenberg (1996) to assess benefits and costs of projects. The details of the model are displayed in Matrices 6.1 and 6.2, and its application to financing infrastructure projects will be discussed next. The decision rule will be based on a vector description of financing[21] options, which can be represented as:

(1) $$F \equiv [(F_1), (F_2),.....(F_n)]$$

[21] Rothenberg (1996) develops his model to assess the benefits and costs of coastal zone management, and has policy options as his decision variable.

where F is the vector of financing options such as loans from various sources or different types of grant transfers, and (F_i) is also a vector representing varying degrees of financing options available; that is:

(2) $$(F_i) \equiv (F_{i1}, F_{i2}, ...F_{im}) \qquad \forall\ i = 1 \text{ to } n$$

where each F_{ij} (j=1 to m) is a financing option of differing size; that is, each F_{ij} could represent different sizes of loans and grant transfers to the local government from various sources.

Matrix 6.1: Project Options (P_i) and Type of Local Government (G_j)

	P_1	P_2	etc. ...	P_n
G_1	F_{11}	F_{12}	...	F_{11}
G_2	F_{12}	F_{22}	...	F_{2n}
etc. ...	...	...	...	...
G_m	F_{1m}	F_{2m}	...	F_{mn}

Each financing option will be associated with a certain type and size of project (P_i) and type and size of local government (G_j) as shown in Matrix 6.1. Financing options F will be presented for each project (type of infrastructure and level of service), and urban local government (metropolitan or other).[22] Each cell in Matrix 6.1 consists of a financing vector which can itself be broken down into its vector components, as shown in Matrix 6.2. The vector components of the F vector may once again consist of vector components.

Thus, the first step is to identify the characteristic of the local government and the type and size of project which is to be implemented. Each G_j will have associated with it variables such as type of urban area, population, income, revenue base (tax and non-tax), etc., and each P_i will be a different project such as water supply, sanitation services, electrification, road provision, etc. The size of the project will of course depend on the size of the population to be served, and the level of service (LOS) for which the LG, after consultation with its constituents, has opted.

[22] Reference is made here to urban LGs as this is the focus of the current investigation, although the analysis could easily be extended to rural LGs.

The next step is to obtain information on each financing option (F_i) pertaining to each project P_i and each local government G_j. This will allow for the development of financing option vectors (F_i) based on the characteristics of the project (P_i) and the local government (G_j). The variables which make up G_j will be important in determining the sources of funding, S_j, which may be available for a given project P_i.

The financing vector (F) will thus be given by:

(3) $$F \equiv [P_1, P_2, \ldots\ldots P_b, G_{b+1}, G_{b+2}, \ldots\ldots G_n]$$

Each financing option, F_i, will thus be associated with a source of funding, S_j, and each F_i can be associated with more than one S_j. Matrix 6.2 shows the financing option and source of financing which will be associated with each project and local government.

Matrix 6.2: Financing Options (F_{im}) and Financing Sources (S_{jn})

	S_{11}	S_{12}	**etc. ...**	S_{1n}
F_{11}	$(H_{11}), (V_{11}), Q_{11}$	$(H_{21}), (V_{21}), Q_{21}$	...	$(H_{1n}), (V_{1n}), Q_{1n}$
F_{12}	$(H_{12}), (V_{12}), Q_{12}$	$(H_{22}), (V_{22}), Q_{21}$	...	$(H_{1n}), (V_{1n}), Q_{2n}$
etc. ...	...	...	...	...
F_{1m}	$(H_{1m}), (V_{1m}), Q_{1m}$	$(H_{2m}), (V_{2m}), Q_{2m}$	...	$(H_{mn}), (V_{mn}), Q_{mn}$

Thus, each financing option will be associated with a source of financing for each project (type and size) and for each local government. The feasibility of the financing option will depend on the impact it has on equity, efficiency, and the possibility of obtaining the funding. The vector H contains human impact variables, referring to expected effects on socio-economic variables such as improved quality of life, increased equity, etc. The vector V represents economic efficiency effects, referring to improvements in the quality, quantity and effectiveness of service delivery. The variable Q will be an assessment of the likelihood of obtaining different types of financing from various sources given the characteristics of the project and the local government. That is,

(4) $$Q_{ij} = f(P_i, G_j)$$

The Q variable will also take into account debt service and the ability of the LG to meet debt obligations. The V vector will contain a variable capturing the ability of LGs to meet O&M costs and to meet all current expenditures through cost-recovery mechanisms, such as user fees. Although for non-revenue generating infrastructure services, such as roads and storm drainage, the ability to meet current expenditures out of local taxes can be considered.

Matrix 6.2 is the key matrix which will provide the policy maker a set of financing vectors, which are in essence the policy alternatives to be selected by the decision maker. The framework will guide the policy maker in answering the following questions: (1) what financing options are available to LGs when trying to financing various infrastructure projects? and (2) what are the sources of funding for each financing option? The crucial step is therefore to identify financing options and sources for each project and local government.

Matrix 6.3 shows the two main types of financing, namely grants and loans, and sources that may be available to local governments for financing infrastructure projects. The cells of the matrix will of course contain values and indexes associated with the variables in the cells of Matrix 6.2. For simplicity, only two rows are shown and one column for each project type, whereas the rows could be expanded to show different sizes of grants and loans, and the columns to show various sizes of the same project, or different levels of service for the same type of infrastructure service.

Matrix 6.3: Local Government Financing Options

Source Type	Central Government	Provincial Government	Development Bank	Commercial Bank
Grants	Definite	Possible	Might be possible	Unlikely
Loans	Might be possible	Possible	Definite	Definite

Each project and local government will be associated with a set of financing options which will be used to generate financing impact vectors, F(I), such that, conceptually at least:

(5) $$F(I^{\alpha}) = [\Sigma_{(i \in M)} NMB_i, (\Delta P_i), (\Delta G_j), (F_i), (S_j), (H_{ij}), (V_{ij}), Q_{ij}]$$

where F(I) is the vector of changes resulting from adopting financing strategy α; $\Sigma_{(i \in M)} NMB_i$ is the aggregate net monetary benefit summed across all issues *i* for which such a calculation is plausible and reliable, that is the set M; ΔP is the set of changes in project *i*, and ΔG is the set of changes in local government values for each issue *j*; F_i and S_j are financing options and corresponding sources respectively; H is the expected impact on socio-economic variables such as equity; V is efficiency effects; and Q is the likelihood of obtaining financing options from various sources.

Strategies will have to be adopted in order to ensure an equitable distribution of benefits while at the same time encouraging efficiency by minimizing costs. Each $F(I^{\alpha})$ should also be chosen to be consistent with broader socio-economic objectives, such as reducing inequality and generating efficiency. Conventional analysis would collapse all vectors into a single monetary scalar, yielding:

(6) $$F(I^{\alpha}) = NMB_{\alpha}$$

The vector financing method provides a vector description of financing impacts, allowing the decision maker to observe the numbers, and its impacts on various goals. The assumption is that decision makers are capable of expressing preferences over the vector combinations of financing choices and policy goals. Just as consumers are capable of generating marginal preference tradeoffs across vector dimensions of commodities, so too can decision makers express preference tradeoffs across vectors of policy choices. To do this, decision makers must "have a sense of the relative importance of different issues to those groups they represent (and thus to the relative importance of small improvements in each of the issues)." (Rothenberg 1996: p.12).

The overall goal of the vector financing method is to increase information available to decision makers, and to provide a matrix from which they can select a set of financing options to be used to finance infrastructure projects in a more transparent way. The next chapter takes this framework one step further by providing an example of how a grant-loan linkage system may work.

Chapter VII. Implementing a Grant-Loan Linkage Strategy: The Example of Water Services

This chapter will illustrate a largely hypothetical application of the VFM, particularly the linking of grants and loans, based on limited data analysis, in order to show the potential strengths of the approach. With more comprehensive data and project appraisals prepared by LGs for either loans or capital grants, the analysis will be much richer and more data intensive. The major decision variables used here are primarily aggregate income, service coverage and the cost of infrastructure provision (capital and current). While the data presented here is for the water sector, it should be borne in mind that any decision on level of service (LOS) for water will depend on the levels accepted for other basic services, such as roads, sanitation, etc. In reality, the decision-making process will be an integrated one where the costs and benefits of different levels of service among the five infrastructure types are made simultaneously.

A. Project Selection and Finance

Parameters calculated will be used in deciding how much of any infrastructure project can and should be financed via private loans, and how much should be financed via grant transfers from either the central or provincial government. Determining this split between grants and loans is crucial to how a grant-loan linkage system will work. A useful point of departure is that suggested by Smoke (1996) where all projects are treated at the outset as if they are to be purely loan financed. Then, based on various social and economic characteristics of the LG or community in question, adjustments can be made for grant finance. As mentioned earlier, grants should be once-off for the capital expenditures of a specific project, and LGs should ideally be able to cover O&M costs out of their current revenues (user fees or taxes).

Another useful approach may be to assess the net present value (NPV) of a project for a given LOS. Calculating NPVs could show whether or not a project is financially feasible. One way to select projects is by ranking them by NPV, or by the ratio of NPV to capital cost as does Ichsan (1995), and then allocating grants in a manner which maximizes the NPV (or NPV to capital cost) over a range of projects. Conventional financial feasibility calculations only measure actual monetary costs and benefits, whereas an economic analysis would also take into account market distortions, such as taxes and externalities (Jenkins and Harberger 1989). An economic analysis may also show that a project is justified even though it is not fully self-financing under reasonable tariff structures (Smoke 1996). Even if a project is not economically feasible, equity concerns, which result from a local government (or local authority) having many poor households, may justify implementing it. Grant allocations would thus be needed in order to ensure that the project becomes financially feasible for the LA or LG. An economic analysis potentially introduces greater uncertainty into the analysis as the calculations are more sensitive to the assumptions which go into calculating the costs and benefits. While project feasibility studies are important, and the MIIF proposes that all LGs prepare them, the analysis below will not explicitly focus on cost-benefit analysis, but rather on how to design a grant-loan linkage mechanism.

The issue of project feasibility and implementation are discussed in the various government documents which outline the MIIF. What is missing is the details of how the flow of grants between different tiers of government will actually occur. This is partly due to the fact that the government is still, via the FFC, in the process of designing a local government grant formula. Provincial grant allocation formulas have already been designed and proposed by the FFC (1995, 1996). It has to be decided whether grant transfers from the center or province will flow directly to LGs or to their constituent LAs. In the case of the metropolitan areas, for example, it has to be decided whether grants will flow to TMCs or their constituent MSSs.

Legally, only LGs are allowed to borrow money, whereas LAs may have neither the legal right nor fiscal capacity to borrow money from private sources. It therefore appears that all money should

flow to the LGs as they have the capacity and right to borrow, and the LGs in turn should allocate funds to LAs for specific projects. LAs could be required to submit proposals and needs assessments for specific projects to LGs, who in turn will make an assessment of the relative need of their constituent LAs, and rank projects according to investment priority. LGs are expected by the MIIF to submit project proposals to the various line ministries and departments of higher tiers of government which are responsible for grant disbursements (South Africa 1995b). This will allow the central government, or its implementing line agency, to decide grant allocations, and to determine whether the LG is satisfying national guidelines. LG project proposals will draw on the information provided to them by their LAs.

While LGs (TMCs in the case of metropolitan areas) are responsible for the provision of municipal infrastructure services, the actual project implementation will occur at the LA or LG sub-structure level (MSS in the metropolitan areas). The LGs will be responsible for borrowing money for all projects and will receive grants from central government line agencies and ministries based on criteria decided upon by the central government and its line agencies. LGs will then pass funds on to LAs in the form of project specific allocations. Even for the basic LOS, for example, the LG will receive a conditional block grant from the center and will then allocate this grant to its various LAs in the form of a project specific or targeted "grant". Relying on LGs and placing fiscal responsibility with them as described above will help overcome the fiscal and institutional disparities that exist among LAs, even within the same LG. Besides tapping into the LG's fiscal and institutional strength, it is less likely to overburden the LAs, especially weaker ones. As the transition progresses, the relationship between LGs and LAs may change, but any infrastructure financing system will have to take into account the manner in which these government bodies relate to each other, and how grant and loan policies may affect their ability to implement projects.

B. Needs Assessment

The first value which the VFM should probably have is the proportion of people living in deprived settlements, in order to identify where user needs may be greatest so as to target grants such that they produce the best potential impacts on equity. A variable which runs across and influences many socio-economic characteristics is local income. The income of the individuals which make up the LG should be calculated as a ratio/percentage of either provincial or national income depending on which tier of government is responsible for infrastructure grant transfers. For the Masakhane Campaign, for example, the ratio to national income is appropriate as the national government is responsible for these transfers, whereas for the Bulk and Connector Infrastructure Grant Program (BCIG) the ratio to provincial government income is appropriate as this money is dispensed by the provincial government to local governments. Tables 7.1 shows hypothetical income ratios of various LAs to LG and national income.[23] It will be assumed that each LG has four distinctive LAs, in this case defined along racial lines. Ideally this table should have income of the beneficiaries of a particular set of projects being compared within the LG and across LAs.

Table 7.1: Income Ratios by LG and LA (Proportion of National Income)

	LG_j	LA1 (African)	LA2 (Colored)	LA3 (Indian)	LA4 (White)
LG1 (Port Elizabeth)	0.30	0.26	0.43	n.a.	2.28
LG2 (Durban)	0.42	0.30	1.09	1.28	3.17
LG3 (Johannesburg)	1.38	0.75	1.34	2.03	3.63
LG4 (Cape Town)	1.15	0.58	0.75	2.32	3.06
National (All S.A.)	1.00	0.45	0.76	1.42	3.35

n.a. = not available

[23] The data is derived from the SALDRU survey for the four provinces containing major metropolitan areas and race groups. In order to illustrate how a grant-loan linkage would work at the level proposed here, it is assumed that each metropolitan area is a LG and each race group a LA.

The lower the ratio to national income the weaker may be the fiscal capacity of the LG (or LA). In the case of South Africa, as shown in Chapter III, there is a strong correlation between race, income, and service delivery. For example, for water services (as with other services) the two lowest income groups -- Africans and Coloreds -- also have the greatest backlog in services, with Africans being the worst off.

The lower the income ratio the more likely it is that grant transfers will be required. The income ratio column "LG_j" in Table 7.1 shows that of the four LGs, two have ratios greater than one (LG3 and LG4) and two have ratios less than half the national average (LG1 and LG2). As for LAs, type LA1 have income ratios below unity (one) in all cases, LA2 types are less than unity in LG4, LG1, and nationally, whereas the LA3 and LA4 groups are above unity in all cases. LAs with the lowest income within each LG can easily be identified from this table. In order to include this variable into the matrices of the VFM, the income ratio can be subtracted from one, resulting in a higher value being eligible for a larger subsidy. This allows the policy-maker to observe income discrepancies not only across LGs, but also across LAs within LGs. An income ratio greater than unity will result in a negative coefficient (parameter) entered into the matrix. Thus the income variable will be calculated as:

$$y_j = (1 - Y_L/Y_N)$$

where Y_L is local income, Y_N is national income, j is LG.

The next step is to identify the lack of access to water, by source, for LGs and LAs. Table 3.5 showed that Indians and Whites have almost 100% access to piped internal water, with Coloreds and Africans having 78% and 17.5% access to piped internal water respectively. When piped yard water is included, Coloreds' access to piped water is about 95%, whereas only slightly over 40% of Africans have access to piped water. The parameter which would enter the matrix would be:

$$pw_j = (1 - APW_j)$$

where APW is access to piped (internal and yard) water for LG_j. A lower proportion of people with piped water would thus be reflected as a higher variable in the matrix implying a greater need for

subsidies based on equity considerations. While the parameter here is at the LG level, it can be disaggregated to show access by project for each LA. For illustrative purposes Table 7.2 contains hypothetical data for the four LGs, shown for total LG ("All LAs") and the poorest local authority ("LA_p") in each LG.[24] This table provides an indication of the variation in access to piped water that can occur across LGs, and within LGs across LAs.

Table 7.2: Access to Piped Water (Percent)

	LG1		LG2		LG3		LG4	
	All LAs	LA_p	All LAs	LA_p	All LAs	LA_p	All LAs	LA_p
Internal	37.6	18.2	18.8	7.5	61.5	33.5	81.4	37.3
Yard Tap	8.1	10.5	12.2	12.6	33.0	56.9	11.9	31.7
Public Kiosk	16.7	22.1	20.0	23.1	5.2	9.0	6.3	29.6
Other	37.6	49.3	49.1	56.8	0.4	0.6	0.5	1.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Another parameter estimate for the VFM matrices, and the variable to be used to assess the infrastructure backlog, is the level of service coverage by LG as shown in Table 7.3. This table provides two parameters, namely population in deprived areas, and percent of people at or below a certain LOS. The greater the proportion of the population at the minimum and basic levels of service, the more upgrading will cost, and hence the greater should be the possibility of qualifying for grant assistance.

A danger with using LOS is that it may create an incentive for LGs to be tardy in making new connections, thereby not covering as many people as possible in the next period, as lower levels of coverage are weighed more heavily in grant allocations. This problem can be overcome by including in the next period a variable or parameter which captures the extent of new connections at the levels of

[24] These numbers are based on the SALDRU survey data for each province with a major metropolitan area, and the poorest LA is data for the African population in each case.

service for which the investment occurred. The higher this value should signal greater efficiency in spending, and low values should weigh less in the grant allocation decision.

Table 7.3: Access by Level Of Service for Water (Percent)

	LG1	LG2	LG3	LG4
Minimum	37.3	7.2	3.9	0.8
Basic	4.1	3.1	22.1	9.0
Intermediate	2.5	4.1	6.3	5.7
Full	27.2	61.1	42.4	21.5
Population in Deprived Areas	71.1	75.5	74.8	37.0
Total	100.0	100.0	100.0	100.0

The parameters for LOS will thus be calculated taking into account the proportion of people with low LOS (minimum and basic). The parameter will be calculated as:

$$LOS_L = LOS_M + LOS_B$$

L is low, M minimum, and B basic.

There are other factors that would enter into the project specific calculations, but data availability and measurement problems at present prevent the calculation of these variables. One of these variables, for example, would be debt service obligations, which cannot be calculated until the LG has negotiated and agreed upon a loan program with a lender. Related to this would be aggregate capital infrastructure investment costs per beneficiary, which can provide a measure of possible debt obligations, although it would be difficult to draw exact inferences regarding debt service obligations from capital cost figures, as debt obligations will depend on the type of loan, the terms of the loan, and the interest rate at which the loan is made. Capital costs will also vary depending on local conditions. The MIIF capital cost data, although limited, can be useful in showing the total capital expenditures that are required for various services levels, and when related to per capita income can give an indication as

to the affordability of various levels of service. To see how capital costs vary across LGs bearing in mind income differences, the following ratio can be calculated for a specific project (P_i) and each LG_j:

$$IIC_{ij} = TKE_{ij}/Y_{ij}$$

where IIC_{ij} is per capita Infrastructure Investment Costs, TKE_{ij} is total capital expenditures per beneficiary for a specific project, and Y_{ij} is per capita income for the beneficiaries of the project.

An important function of grant allocations is to supplement borrowing from private sources, such as commercial banks or the DBSA. The idea is that grant transfers should allow LGs to provide a LOS which they would not be able to provide without a grant transfer, but grants should not attenuate the incentive to borrow, rather they should encourage it. For example, a LA may be able to afford borrowing for the basic LOS, but with grant assistance may be able to borrow for an intermediate LOS. This would be especially beneficial if the O&M costs of higher service levels are less than those of lower levels.

South Africa (1995a) stipulates the national government's position that all current expenditures, basically O&M costs, should be financed out of own LG revenues. It is feasible, though, that subsidies may be forthcoming even for O&M expenditures, especially in poorer LGs. The idea is to minimize any long-term or continuous subsidies, by having infrastructure subsidies generally be once-off transfers. The report suggests using O&M to total capital expenditures as a measure of whether grants should be allocated to a LG wishing for a certain LOS. In other words, the higher this variable the less likely a grant for that service level will be. The problem with this is that it is very difficult to estimate O&M costs, especially for new services. It may also be that O&M costs to income is highest for poorer LAs due to their lack of institutional capacity to minimize such costs. Local topography may dictate using a technology with high O&M costs, implying that only technologies with high O&M costs may be feasible given the topography of the region. Thus while lower O&M costs will mean that a project's current expenditures should be more manageable by the LA, it should be noted that LAs may have very little control over O&M costs, especially if they have little choice regarding use of technology.

Also, the government's own calculation of O&M costs is done by first calculating total upgrading and capital costs, and then calculating O&M costs as a fixed percent for all levels of service. It is assumed that O&M costs will be 3% of total upgrading costs and 6% of bulk infrastructure expenditures (upgrading plus new developments). These assumptions may be reasonable, but it should be expected that O&M costs will vary across LGs, and within LGs across LAs due to idiosyncratic factors. The most important difference would be in institutional strength and capacity, which in turn relates to the ability to implement projects in a timely and cost-effective manner. O&M costs should be calculated for each LG and LA based on their characteristics and the projects they are proposing, which may use different technologies.

A constraint may be placed on water service costs such that they, for example, do not exceed 5% of household monthly (or annual) income.[25] Annual debt repayments for the project by LGs should be included in the current budget for any given year, implying that in terms of current expenditures the correct parameter calculation should add O&M cost and total capital expenditures. Debt repayments per annum for a project will be directly affected by the grant the LG receives at the start of the project, as a larger grant implies that the LG will have to borrow less, thereby reducing their debt service. This would yield total per capita LG_j expenditures (TE) per annum for a specific project (P_i):

$$TE_{ij} = (O\&M_{ij} + \text{Debt Repayments}_{ij})/Y_{ij}$$

Besides the project debt, overall debt obligations of the LG will also have to be considered. Other parameters may also be calculated to capture other socio-economic characteristics, provided that reliable data is available. One variable which should determine grant allocations is the source, and terms of loans to LGs. For example, if certain LGs can only borrow from the DBSA due to their weak financial conditions, then they should in principle qualify for more grant assistance than LGs which can

[25] Smoke (1996) quotes J. Bastin and C. Shugart (1992) "Financing Municipal Water Supply in Indonesia," Harvard Institute for International Development, Jakarta, which provides a rule of thumb that households should spend no more than about 5% of their monthly income on water. This is, however, an arbitrary figure, and while some analysts would not agree with this rule, it does provide a useful benchmark for the current analysis.

issue bonds. These effects will to some extent be captured by the indicators outlined above, such as income. What is needed is for the LG to submit in its proposal to the higher tier of government an estimate of various loan sources and terms of these loans.

C. *Linking Grants and Loans*

This section will illustrate two potential schemes for linking grants and loans. An actual grant-loan linkage system may look very different depending on what is determined to be politically and economically feasible. The design of a grant-loan linkage system would most likely be a central government decision and not a local one. The data presented thus far has been very aggregate, with detailed data for only the four major metropolitan areas. Ideally, detailed disaggregations by LGs and their constituent LAs would be preferred. As these numbers are not readily available, this section will provide a manufactured example of how a grant-loan linkage mechanism may work. The numbers shown here are purely hypothetical and are used for illustrative purposes only in order to demonstrate how the grant and loan split can be determined. The lack of detailed data serves to restrict the depth of empirical, though not conceptual, analysis that can be ventured.

Matrix 7.1 contains general information regarding four socio-economic indicators for four LGs.[26] These values are calculated as described in the previous section, and a higher value should signal a greater need for grants based primarily on equity considerations. The "Sum" column is a summation of all the parameter estimates, in other words each parameter is given an equal weight of one. In reality, the sum can be calculated using different weight assignments for each of the parameters, based on objective criteria. What will ultimately determine the grant allocation is the weight calculation W_i in the last column, which is constrained such that the weights for all LGs add to one.

[26] These numbers are based on data for Africans in the four major metropolitan areas. The analysis that follows uses data adapted from the MIIF and the SALDRU survey.

Matrix 7.1: Needs Assessment for Water Services

	Pop'n	Income	Piped Water	Low LOS	Sum	Weight
LG1	0.71	0.70	0.71	0.41	2.53	0.34
LG2	0.76	0.74	0.80	0.10	2.40	0.32
LG3	0.75	0.25	0.10	0.26	1.36	0.18
LG4	0.37	0.42	0.31	0.10	1.20	0.16

Pop'n = number of people in deprived settlements
Income = one minus ratio of local to national income
Piped water = one minus number of people with piped water connections
Low LOS = number of people with minimum and basic service levels

This grant allocation is perhaps the simplest in the sense that grants are to be allocated in proportion to the weight assigned to the LG. In this case it is assumed that the central government has performed a national water infrastructure needs assessment and has set aside a nominal capital grant g in its national budget for allocation to LGs for capital investment expenditure purposes for infrastructure type k. This capital grant will be X_{gk} in total. The capital grant allocation would be CG_{ij} to LG_j for a specific water project P_i would be given by:

$$CG_{ij} = W_{ij} * X_{gk}$$

This ensures that the total capital grant allocation is divided among LGs for the provision of water services based on need. Any shortfall in capital expenditures will have to be met by borrowing money in order to provide a certain level of service.

Matrix 7.2: Capital Costs by Level of Service (Rands per beneficiary per annum)

	Basic	Interm.	Full
CapCost	180	240	300
O&M	10	15	20
TCost	190	255	320

CapCost = Capital Costs
O&M = Operations and Maintenance
TCost = Total Cost

Matrix 7.2 shows hypothetical annual per beneficiary costs for bulk (upgrade plus new) water infrastructure service delivery, and these costs include debt service.[27] These costs are, for simplicity, assumed to be the same across all four LGs.

Matrix 7.3 summarizes grant and loan amounts which would be required by each of the four LGs for different water service levels assuming the above capital grant allocation scheme. It is assumed that the government wishes to subsidize the capital cost for all LGs up to a basic level of service, as proposed by Department of Finance (1996). Thus the annual capital cost for the basic level for water services is R180 per beneficiary (p.b.), producing a total capital grant pool p.a. among the four LGs of R720 p.b.

Matrix 7.3: Amount of Capital Grants and Loans in Basic Scenario for Water Services (Rands per beneficiary per annum)

	Grants	Loans		
		Basic	Interim.	Full
LG1	243	0	0	57
LG2	231	0	9	69
LG3	131	49	109	169
LG4	115	65	125	185

It is assumed that such capital grants will be distributed to the LGs as a conditional/targeted block grant; i.e. a lump-sum transfer to each LG to be spent on the five infrastructure services. As such LGs are free to spend the grant on any LOS and in any proportion among its LAs, but there should be a constraint that they provide at least a basic level of water services. A similar analysis can be done for all five infrastructure services discussed in the MIIF, where the LG would receive a conditional block grant and can spend the money on any of the five services in any proportion, as long as they provide a basic level of service for each infrastructure type. Matrix 7.3 shows the conditional block grant allocation which will be allocated to

[27] All figures are shown on a per annum basis, whereas in reality loans will be taken in increments of a few years, such as five, ten, fifteen or twenty. These loan amounts and scheduled repayments could be converted to annual figures, as is done here, using appropriate discount rates.

water services for each LG. LGs have the choice of LOS, and the level chosen will determine the amount of money they will have to borrow in order to meet the difference between the grant allocation and the capital expenditures. For all four LGs the basic LOS will mean the least amount of borrowing requirements, and the most money will have to be borrowed for the full levels of service.

Next a system will be designed where the grant-loan linkage is tied more directly to affordability of infrastructure projects to the LG and its residents. Given that the focus is on promoting equity, income is used as the key decision variable as it most directly influences affordability.

Matrix 7.4: Capital Grants and Loans Linked to Affordability for Water Services (Rands per beneficiary per annum)

		Expenditure			Revenue			
	Income	CapCost	O&M	TCost	MaxRev	Loans	Rev-Exp	Grants
LG1								
Basic	2,500	180	10	190	125	115	-65	65
Intermediate		240	15	255	125	110	-130	130
Full		300	20	320	125	105	-195	195
LG2								
Basic	2,200	180	10	190	110	100	-80	80
Intermediate		240	15	255	110	95	-145	145
Full		300	20	320	110	90	-210	210
LG3								
Basic	6,400	180	10	190	320	310	130	0
Intermediate		240	15	255	320	305	65	0
Full		300	20	320	320	300	0	0
LG4								
Basic	5,000	180	10	190	250	240	60	0
Intermediate		240	15	255	250	235	-5	5
Full		300	20	320	250	230	-70	70

Affordability will be the key decision variable in determining the split between grants and loans for water service delivery. Costs are assumed the same across all four LGs for each project type (or LOS), whereas in reality these costs would vary by project (or LOS) for each LG.

Variables in Matrix 7.4 are defined as follows: *Income* is household per capita income. *CapCost* is the annual capital cost of infrastructure investment for a water project of given LOS. *O&M* represents operations and maintenance costs by LOS, and it is assumed that LGs will have to recover this cost from the beneficiaries of the project. *TCost* is the total project cost, that is O&M plus capital costs. *MaxRev* is the maximum amount of revenue which can be collected from consumers and is based on affordability, i.e. the 5% rule for water. *Loans* are the amount LGs will have to borrow in order to cover capital costs, such that per capita expenditures on water bills (O&M plus debt repayments) are equal to the desired maximum household water expenditures (5% for water services). As O&M costs are fully recovered from the beneficiaries, *Loans* will equal the difference between *MaxRev* and *O&M* costs. Debt repayment schedules are not known, and it is assumed that the loan figures include debt repayments. The debt capacity of the LG should, of course, equal to the maximum amount of revenue it can collect, i.e. the amount consumers can reasonably be expected and afford to pay. *Rev-Exp* shows the shortfall of revenue over expenditure; i.e. *MaxRev* minus *TCost*. To assess the capital grant the LG will need, the revenue shortfall net of O&M costs must be calculated, and is given by the difference between *Loans* and *CapCost*. This difference produces the same figures as those observed in the *Rev-Exp* column. *Grants* will be the amount of intergovernmental capital grant finance needed by the LG to finance a certain LOS once loan amounts have been determined. i.e. the difference between loans and capital costs in this case. In reality the central government will decide capital grant allocations for each project and LG based on what it believes the LG can reasonably be expected to borrow for a given project.

In the absence of capital grants the full capital costs will have to be borne by the LG, and for this example it is assumed that these costs will have to be recovered directly from the beneficiaries and not through the tax base, although this need not be the case. The maximum amount of revenue the LG can reasonably be expected to generate should be indicative of the amount of debt which the LG can afford to assume. Once this debt burden of the LG has been figured out, the shortfall of revenues over expenditures can be calculated; this is shown in the *Rev-Exp* column. This shortfall can be calculated as

either "*MaxRev* minus *TCost*" or "*Loan* minus *CapCost*". The negative of this shortfall produces the amount of capital grant assistance the LG will need in order to provide various levels of infrastructure services, in this case water. In cases where there is a surplus, such as for all levels of service for LG3, the grant transfer to that LG will be set at zero.

Matrix 7.4 shows that the maximum (annualized) capital grant transfer for water services to LGs, assuming all four opt for the full LOS, will be R475 p.b. Should all four choose the basic LOS the annualized grant transfer will be R145 p.b., and if they select the intermediate service level the grant transfer will be R280 p.b. These figures are all much less than the grant transfer of R720 p.b. which would result if the central government chooses to subsidize all LGs up to the basic LOS. In the new grant-loan split LGs have to assume higher debt levels than they would otherwise, but such levels should be bearable as it is assumed that debt repayments and O&M costs for water services will have to be kept within affordable limits, i.e. 5% of annual household income in the case of water.

The preceding examples were only intended to be illustrative of the basic mechanisms of a grant-loan linkage system. They used very aggregate data, such as average income, rather than the income of the beneficiaries of a specific project, which might be more appropriate. Also, costs structures are assumed the same across LGs for each project (or LOS), whereas in reality costs will vary by project for each LG, and projects may also have different costs across LAs within the same LG. An actual grant-loan linkage would take into account project specific costs for each LG (or LA) and the income of the beneficiaries of that particular project.

The above analysis suggests that a policy which encourages LGs to rely more on loans will be more cost-effective for the central government, and could thereby ease pressures on the national fiscus. This would imply rethinking the government's current policy as outlined in the MIIF (South Africa 1995b) and DOF (1996) of providing subsidies to all LGs for the basic LOS. Certain LGs will require fewer, and some perhaps no subsidies, and a policy which seeks to promote long run efficiency should encourage higher income LGs to borrow even for basic levels of services. The simple experiment above

also shows that a grant loan linkage which "forces" LGs to borrow close to their maximum affordable debt service levels has the potential of being cheaper for the central government in the sense that lower intergovernmental transfers are required. Fewer grant transfers to LGs and higher debt levels mean that LGs will have an incentive to make greater use of revenue local sources, such as local tax bases and especially cost-recovery schemes through user charges. Such a policy could also force LGs to redistribute internally among its LAs through either taxes or cross-subsidization of user fees. This would be especially important in LGs which are fiscally strong.

The analysis above has shown the way in which the VFM can present data to the policy-maker in order to decide how to split grants and loans among various LGs and different levels of service for the same type of infrastructure project, namely water. It should be borne in mind that if other services are included, the affordability calculations will be interpreted relative to total costs and service levels will be a function of relative costs and benefits. The policy-maker will have a more complex decision problem as there will be more dimensions of decision-making, and tradeoffs will be considered not only within an infrastructure service, but also between services. The VFM will facilitate decision-making as it allows the costs and benefits of policy-decisions to be presented along many dimensions. This makes it easier for the policy-maker to identify not only areas of greatest need, but also where the returns to infrastructure investments are likely to be relatively higher.

Chapter VIII. Concluding Remarks

This thesis developed a framework for linking intergovernmental grants and local government borrowing from private sources, in an attempt to encourage efficiency while promoting equity in the delivery of infrastructure services. The idea is that intergovernmental grants should be used to facilitate equity objectives, while not attenuating the incentives of local governments to borrow to finance investments. A system which links grants and loans can, if managed properly, increases the amounts borrowed for investment purposes. Pressures to repay loans encourage local revenue generation through cost-recovery, especially user fees, and greater utilization of local tax bases. The amount of grants vis-à-vis loans that a local authority will be able to obtain will depend on various indicators, such as local income, levels of existing service provision, the population living below the poverty level etc., and the type, size and relative cost of the project being proposed.

Chapter II outlined the evolution of local governments from Apartheid structures of separate local authorities for various race groups, to post-Apartheid structures where previously separate local authorities have been amalgamated. The new structure of local government, while better equipped to deal with the problems facing communities, is characterized by inequalities between, and within, local governments.

The backlog in infrastructure service needs is detailed in Chapter III, using data from the SALDRU (1994) household survey. Access to infrastructure services is along racial lines with Whites having the highest levels of access and Africans the lowest. Drawing on the MIIF estimates, data is also provided for the proportion of the population within the four major metropolitan areas living in deprived low-income settlements. Access to service is given by the five basic services, namely water, sanitation, storm drainage, roads, and electricity, and by level of service for each service.

Chapter IV analyzes cost estimates for addressing the backlog in infrastructure services. Costs are calculated for upgrading existing infrastructure, and for providing services to new settlements, known

as greenfield development sites. The data show that it would be impossible to meet the backlog in one year, but that the ten year program proposed by the MIIF for infrastructure investments is reasonable.

The role of local governments in infrastructure service provision is detailed in Chapter V, along with an assessment of the share which local governments constitute of total government in terms of revenues and expenditures. Revenue patterns show that local governments raise approximately 80% of their income through their own sources, such as taxes and user fees, and receive only about 20% of income in grants from higher tiers of government. Provincial governments on the other hand rely heavily on grant transfers, over 90%, and own-revenue constitutes a small proportion of their income. Local governments' current-capital expenditure breakdown in percentage terms is 70-30, whereas provincial governments' is 93-7. Capital expenditure as a percent of local government expenditure has declined over the last decade. These figures indicate local governments are reasonably well equipped to deal with the responsibility of delivering infrastructure services to their residents. Estimates by the DOF (South Africa 1992) show that under a fully devolved system of government, the share of local governments in total government expenditure would rise by much more than revenue generation. This points to a system where local governments' revenue sources are limited especially in the short run, but where expenditure will have to increase by large amounts.

Chapter V also briefly outlines various short-run initiatives implemented by the central government in order to "kick-start" infrastructure service delivery at the local government level. The analysis shows a system that is poorly coordinated and where double-subsidization of end-users can easily, and in some cases does, occur.

The analysis in Chapters II-V shows that financing the backlog in infrastructure will place major strains on the finances and institutions of local governments. Income disparities suggest that intergovernmental grants will have to be used to address issues of equity. The government has expressed an opinion through the MIIF that urban local governments should, as far as possible, rely on loans to finance the capital expenditures associated with infrastructure investments, and also be able to cover as

much of their own operating costs as possible. Loan repayment is also expected to put pressure on local governments to raise their own revenue through user fees and greater utilization of local tax bases.

Chapter VI develops the vector financing method to identify various financing sources based on the characteristics of the LG and the type of project being proposed. The ultimate objective is to link grants and loans in a manner which allows the central government to meet equity objectives, while not attenuating the incentives of local governments to borrow, thereby encouraging greater efficiency. The system should be designed such that grants encourage local governments to borrow money to finance higher levels of services than they would have without grants. An application of the framework is illustrated in Chapter VII using limited data. The lack of data restricted the empirical, though not the conceptual, application of the grant-loan linkage method. The analysis revealed that in terms of minimizing long-run central government grant transfers, it may be more prudent to subsidize different levels of service, depending on local fiscal conditions as opposed to subsidizing all LGs up to the basic level as currently proposed by the central government.

The vector financing method allows the decision maker to observe the possible impacts of various financing options on policy variables of interest. The framework is intended to help policy-makers identify areas of greatest need, and assess what proportion of infrastructure project finance should be in the form of grants versus loans.

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