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FINANCING OF RESIDENTIAL INFRASTRUCTURE TO SUPPORT HOUSING DEVELOPMENT IN SRI LANKA -- ISSUES AND OPTIONS

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Sri Lanka

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INTRODUCTION - THE ROLE OF INFRASTRUCTURE IN THE PROVISION OF HOUSING

Providing adequate residential infrastructure services is an integral component of meeting national housing needs. This paper presents a framework for analyzing housing-related infrastructure investment requirements which can be incorporated into the development of more general strategy for financing housing needs. The paper discusses the institutional arrangements for infrastructure provision; it develops a procedure for estimating residential infrastructure needs and identifies the major factors influencing the cost of service provision; it demonstrates how to determine the availability of resources, both public and private, to finance investment requirements; finally, it provides local planning and housing officials with policy alternatives for meeting resource requirments within budget constraints. Sri Lanka is used as a case study to illustrate the application of the general framework.

The Government of Sri Lanka has identified improvement of housing, both construction of new units and upgrading of sub-standard housing, as a national priority. Provision of residential infrastructure facilities -- adequate water and sanitation systems, electrical connections and access roads -- is an integral part of this effort. Public investment in the housing sector itself has shifted from a costly program of direct construction to a more selective approach that emphasizes public provision of infrastructure, land, and finance as a stimulus for private housing investment.1/

Infrastructure investment is a critical factor to consider in developing an effective national housing strategy. First, there is evidence to suggest that provision of infrastructure can leverage private investment. Strassman argues that access to water, in particular to indoor piped water, may be as important as security of land tenure in spurring other expansions and improvements by owner-occupied households.2/ His analysis shows that the availability of indoor piped water, more than any other infrastructure system, is correlated with higher housing values.3/ Jimenez also found that slum upgrading and sites and services projects, which provide basic infrastructure services as well as greater security of tenure to low income urban residents, stimulate private housing investment and raise the average dwelling value by a substantial magnitude in a short time.4/

Second, since infrastructure costs represent a significant share of total housing investment requirements, re-evaluating the standards implicit in these costs and adopting lower cost technologies can stretch public investment dollars and increase housing affordability. PADCO estimated that infrastructure services account for nearly 50 percent of the total cost of a simple shell house in rural Sri Lanka. Lowering infrastructure standards -- providing communal versus individual water and sanitation facilities and more rudimentary access roads -- reduces infrastructure costs by as much as one half.5/ By this lowering of standards, rural housing becomes affordable by rural families in all but the bottom 20 percent of the income distribution, according to PADCO estimates.6/

Finally, since many infrastructure facilities, including water, sewerage, and electricity, lend themselves to user charge financing, they provide opportunities for cost recovery, thereby insuring a substantial source of funding for additional service improvements and extensions.7/

RESPONSIBILITY FOR INFRASTRUCTURE PROVISION

Infrastructure facilities are typically divided into two components: 1) supply sources, such as electrical generating facilities, bulk water supply facilities, trunk highway lines, and 2) distribution systems, including water mains, sewer lines, electrical connections, and feeder roads, which connect the main supply source or network with individual housing units. These distribution systems, which support individual housing sites, are referred to as residential infrastructure. Clearly, the provision of residential infrastructure depends, to a large extent, upon the adequacy of the supply sources.

Infrastructure facilities, both bulk supply and distribution systems, can be provided either by the public or private sector. In Sri Lanka, most facilities are publicly provided, except in the transportation sector where private operation of bus transport has flourished since government controls on private operators were lifted in 1979.

Public responsibilities for infrastructure provision can also be highly centralized or decentralized depending on the governmental administrative structure. Sri Lanka follows the British model which distributes infrastructure responsibilities among three major governmental entities -- the central government, local authorities, and public corporations.8/ The central

government provides the major infrastructure supply systems -- large water supply projects, the national highway system, telecommunications facilities, and public transport. The National Water Supply and Drainage Board (WDB) was formed in 1975 to be the lead agency for developing all urban and rural supply schemes. In 1981, the agency expanded its authority by assuming responsibility for the sewerage system of the island's largest city, Colombo. The Department of Highways (DOH) has responsibility for construction and maintenance of all major trunk highways, about 13 percent of the public road stock in Sri Lanka. A government owned corporation created in 1969, the Ceylon Electricity Board (CEB), is vested with responsibility for bulk electricity supply. The CEB also retails electricity to all heavy industrial commercial and industrial users as well as to some residential users, mainly in the Colombo area.

With some exceptions, local governments9/ have primary responsibility for provision of the distribution networks -- extensions of water and sewer lines, electrical connections, local roads and drainage systems, and for the maintenance of these systems.

Responsibility for infrastructure provision differs between urban and rural areas. In well developed urban areas with active local governments, responsibilities are typically divided along the lines described above. The obvious exception is Colombo whose water distribution and sewerage system is operated by the National Water Supply and Drainage Board. In rural areas where the local government structure may be weaker,10/ the central government -- the WSD and the Ministry of Health in the case of water and sanitation -- commonly plays a more prominent role. The extent of central government

involvement, however, depends on government investment priorities in rural versus urban areas. In the case of water at least, the Government of Sri Lanka has focused its investment program on major water supply projects in large urban centers.

ESTIMATING RESIDENTIAL INFRASTRUCTURE NEEDS

Any analysis of the costs of providing adequate residential infrastructure should begin with an estimate of needs.

Baseline Data

Information on the current level of infrastructure services by housing unit is critical to establish a baseline from which needs estimates can be projected. This baseline provides a benchmark from which several policy options can be developed. The government may choose to maintain service levels as they are, to upgrade them either selectively or across the board, or, less likely, to allow them to decline.

Sri Lanka has a wealth of data available both on current and past residential infrastructure service levels from its decennial censuses.

Overview of Current Conditions. Tables 1, 2 and 3 summarize the census information regarding the provision of water, sanitation facilities, and electricity for all occupied housing units in urban and rural areas and the estate sector.11/ As Table 1 shows, little progress has been made during the

Table 1

PERCENTAGE DISTRIBUTION OF OCCUPIED HOUSING UNITS BY SOURCE OF WATER SUPPLY BY SECTORS - 1971 and 1981

Source	All Sectors		Urban Sector		Rural Sector		Estate Sector	
	1971	1981	1971	1981	1971	1981	1971	1981
Piped water on tap	20.1	17.3	45.3	46.5	4.8	5.1	74.7	65.6
Well	68.8	73.1	50.5	48.7	81.9	84.5	15.4	20.4
--Protected well	(N.A.)	(52.3)	(N.A.)	(43.7)	(N.A.)	(58.1)	(N.A.)	(16.4)
River, Tank or other source	8.9	7.0	2.0	1.1	11.0	8.5	7.3	5.8
Not Stated	2.3	2.7	2.1	3.7	2.3	1.9	2.1	8.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Department of Census & Statistics, Census of Housing and Population - Sri Lanka, 1981, housing tables, preliminary release #3, June 1982.

Table 2

PERCENTAGE DISTRIBUTION OF OCCUPIED HOUSING UNITS BY TYPE OF TOILET BY SECTORS - 1971 and 1981

Source	All Sectors		Urban Sector		Rural Sector		Estate Sector	
	1971	1981	1971	1981	1971	1981	1971	1981
Flush toilet	6.7	4.8	22.8	15.6	2.2	2.1	8.2	4.9
Water Seal	14.3	21.9	19.2	38.9	9.9	17.5	33.9	24.2
Pit Type	38.8	37.9	18.3	17.0	44.4	43.5	38.2	32.3
Bucket Type	4.8	2.0	19.4	8.8	1.0	0.3	4.1	2.1
None	34.3	30.9	19.1	16.4	41.5	34.8	13.4	28.1
Unspecified	1.2	2.5	11.3	3.4	1.0	1.7	2.2	8.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Department of Census & Statistics, Census of Housing and Population - Sri Lanka, 1981, housing tables, preliminary release #3, June 1982.

Table 3

PERCENTAGE DISTRIBUTION OF OCCUPIED HOUSING UNITS BY PRINCIPAL TYPE OF LIGHTING BY SECTORS - 1971 and 1981

Source	All Sectors		Urban Sector		Rural Sector		Estate Sector	
	1971	1981	1971	1981	1971	1981	1971	1981
Electricity	9.0	14.9	34.5	45.9	2.8	8.3	4.1	5.6
Kerosene	89.4	82.4	N.A.	51.2	N.A.	89.6	N.A.	86.5
Other		0.4	N.A.	0.1	N.A.	0.5	N.A.	0.2
None	1.6	0.3	N.A.	0.3	N.A.	0.3	N.A.	0.6
Not Stated		2.0	N.A.	2.4	N.A.	1.3	N.A.	7.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Department of Census & Statistics, Census of Housing and Population - Sri Lanka, 1981, housing tables, preliminary release #3, June 1982.

decade of the 1970's towards the provision of piped water to Sri Lankan households. Currently, less than one out of five households has access to piped water. While well water, specifically from protected wells, is an acceptable alternative in rural areas, provision of piped water is still considered to be the most effective means of protecting water supply sources from pollution in urban areas.

Provision of sanitary facilities has improved over the decade with a reduction both in the number of households without any toilet facilities and in the number of households using unsanitary bucket type latrines (see Table 2).

Finally, there has been a rapid increase in the use of electricity, although kerosene lamps are still the predominant type of lighting (see Table 3).

Conditions by Sector. In general, urban areas have achieved a higher level of infrastructure service in Sri Lanka than their rural or estate counterparts. Nearly half of all urban households have access to piped water, although half of these are supplied through communal standpipes (see Table 1).12/ In Colombo, nearly one-third of the housing units have piped water on the premises.13/ By contrast, well water continues to supply the vast majority of rural households in Sri Lanka and nearly one-third of these rural wells are unprotected (see Table 1). The estate sector shows a relatively high degree of access to piped water, but for the majority of households, this is available off the premises.

Urban areas have also achieved a higher level of sanitation. As Table 2 indicates, over half of all urban households have access to a flush toilet (15.6 percent) and to the increasingly popular and simpler pour flush-water seal toilet (38.9 percent). Only Colombo has a conventional waterborne sewerage system. The system, however, is old and overloaded and provides no treatment.14/ Pit latrines continue to be the dominant form of sanitation in rural areas (see Table 2). Over one-third of all rural households have no toilet facilities, down from forty percent a decade earlier. Conditions in the estate sector are only marginally better than in rural areas and have worsened over the last decade.

Nearly half of all urban households have electricity, up from one-third in 1971 (see Table 3). Access to electricity is highly concentrated, however, in urban areas. The vast majority of households in the rural and estate sectors continue to depend on kerosene lighting as their principal source.

Conditions by Income Group. The census does not provide direct information on the provision of infrastructure services by income group.15/ Housing type, however, can serve as a proxy for income level and the census has aggregated data by three housing classifications - permanent, semi-permanent, and improvised units. The latter are made of non-durable materials, typical of the shanty units in urban areas.16/ Semi-permanent structures contain a mix of durable and non-durable materials; this type of unit is prevalent in rural areas. Both improvised and semi-permanent units are, not unexpectedly, associated with lower income levels.

Tables 4 through 6 summarize data on infrastructure service provision by housing type from the 1981 Census. In general, the poorest quality units have

Table 4

PERCENTAGE DISTRIBUTION OF OCCUPIED HOUSING UNITS BY SOURCE OF WATER SUPPLY BY TYPE OF HOUSING UNIT - 1981

Source	All Units	Permanent Unit	Semi-Permanent Unit	Improvised Unit
Piped water on tap	17.3	23.1	13.4	10.9
Well	73.1	70.3	74.6	78.6
--Protected well	(52.3)	(57.3)	(47.4)	(59.2)
River, tank or other source	7.0	3.2	9.8	8.1
Not stated	2.7	3.4	2.1	2.8
Total	100.0	100.0	100.0	100.0

Source: Department of Census & Statistics, Census of Housing and Population - Sri Lanka, 1981, housing tables, preliminary release #3, June 1982.

Table 5

PERCENTAGE DISTRIBUTION OF OCCUPIED HOUSING UNITS BY TYPE OF TOILET BY TYPE OF HOUSING UNIT - 1981

Type of Toilet	All Units	Permanent Units	Semi-Permanent Units	Improvised Units
Flush toilet	4.8	9.9	1.1	0.5
Water Seal	21.9	40.6	8.8	5.3
Pit Type	37.9	33.2	44.3	16.2
Bucket Type	2.0	3.0	1.2	1.8
None	30.9	10.2	42.4	73.2
Unspecified	2.5	3.0	2.1	3.0
Total	100.0	100.0	100.0	100.0

Source: Department of Census & Statistics, Census of Housing and Population - Sri Lanka, 1981, housing tables, preliminary release #3, June 1982.

Table 6

PERCENTAGE DISTRIBUTION OF OCCUPIED HOUSING UNITS BY PRINCIPAL TYPE OF LIGHTING BY TYPE OF HOUSING UNIT - 1981

Source	All Units	Permanent Unit	Semi-Permanent Unit	Improvised Unit
Electricity	14.9	34.0	1.1	1.6
Kerosene	82.4	63.0	96.6	94.1
Other	0.4	0.3	0.3	1.9
None	0.3	0.1	0.4	1.0
Not Stated	2.0	2.6	1.5	1.4
Total	100.0	100.0	100.0	100.0

Source: Department of Census & Statistics, Census of Housing and Population - Sri Lanka, 1981, housing tables, preliminary release #3, June 1982

the poorest level of infrastructure service. Eighty percent of all permanent units have access to piped water (23.1 percent) or to protected wells (57.3 percent). For semi-permanent and improvised units, the percentage falls to 60 and 70 percent respectively, with a much lower proportion of units accessible to piped water (see Table 4). The differences are even sharper with respect to sanitation facilities. Approximately half of all permanent units have a flush or water seal toilet, while the figures for semi-permanent and improvised units drop precipitously, to under 10 percent (see Table 5). Similarly, access to electricity is highly confined to permanent units (see Table 6).

Estimating Future Needs

Projecting residential infrastructure investment requirements involves several steps. First, a reasonable planning time frame must be identified. For Sri Lanka, a 20-year planning horizon has been adopted.17/ Second, any needs estimate must be built on two components:

1) The number of housing units which require upgrading, an estimate of the needs backlog, and

2) The number of new housing units which will be required to service population growth and normal replacement of depreciated units.18/

Finally, cost figures must be matched with quantity estimates (i.e. number of housing units) to derive total investment figures.

Baseline data, such as that provided by the 1981 Census, can furnish the information necessary to calculate the number of housing units requiring infrastructure improvements. Implicit in this calculation is the assumption of a standard, or set of standards, to which facilities will be upgraded. Table 7 summarizes those minimum standards which the government of Sri Lanka considers acceptable regarding the provision of water and sanitation facilities in urban and rural areas. Similar standards were not available regarding the provision of electricity or local access roads. In the latter case, the standards proposed from another study of housing needs in Sri Lanka were used for purposes of illustration.19/

Applying these standards to the housing stock as reported in the 1981 Census yields a picture of current residential infrastructure deficiencies (see Table 8). Adding the number of new housing units that will require infrastructure services to this backlog needs' figure yields a total estimate of needs expressed in terms of housing units. Finally, applying a dollar cost for infrastructure provision to the latter figures provides an estimate of average yearly investment requirements, summarized in Table 9.

Patterns of Need

As Table 9 shows, needs as measured by number of units requiring upgrading or new infrastructure service, are most heavily concentrated in the rural sector. Although the cost of providing rural infrastructure is nearly 30 percent lower than in urban areas, when needs are expressed in monetary terms, rural requirements still command the largest investment share (75 percent).

Table 7

DEFINITION OF MINIMUM RESIDENTIAL INFRASTRUCTURE STANDARDS - SRI LANKA

Facility	Minimum Standard	
	Urban Areas	Rural Areas
water[a/]	piped water, on or off premises	protected communal well
toilet[a/]	individual water seal toilet with septic tank	individual water seal toilet with septic tank
access road[b/]	laterite street	laterite street

a/ Standards as defined by the Chief Architect of the National Housing Development Authority, cited in Housing Needs and Investment in Sri Lanka: 1981 - 2000 by Raymond Struyk, January 1983, pp. 11-13, Annex 3.

b/ Source: PADCO, Meeting Housing Needs in Sri Lanka, October 1982, p. 18 and p. 23.

Table 8

NUMBER AND PERCENTAGE OF HOUSING UNITS IN 1981
FAILING RESIDENTIAL INFRASTRUCTURE STANDARDS

Infrastructure Facility	Urban		Rural		Estate	
	# of units (000)	Percent of Total	# of Units (000)	Percent of Total	# of Units (000)	Percent of Total
Water	272	53.5	766	36.8	75	34.4
Toilet	279	54.7	1,720	82.5	186	85.8
Maximum[c/] # of Units Failing the Standard	279		1,720		186	
Less the[d/] Total # of Improvised Units	39		139		2	
Net # of Units Needing Upgrading	240		1,859		184	

a/ Deficiencies could only be derived for water supply and sanitary facilities.

b/ Standards for the estate sector were assumed to be the same as urban standards.

c/ Assumes that the same unit is deficient in meeting all infrastructure standards.

d/ Assumes that these substandard units will be replaced and thus, will be counted in the estimate of new housing needs. Including them here would result in double counting.

Sources: Raymond Struyk, Housing Needs and Investment in Sri Lanka: 1981 - 2001, p.14, Annex 5, and The Census of Housing and Population - Sri Lanka, 1981.

Table 9

RESIDENTIAL INFRASTRUCTURE NEEDS
ESTIMATE - SRI LANKA - 1981-2001

A. Quantity of Housing Units Requiring Infrastrucutre Services (Annual Average)

	Total (000)	Urban (000)	Rural (000)	Estate (000)
# of Units Requiring Upgrading[a/]	114	12	93	9
# of New Housing Units Requiring Service[b/]	170	28	136	6
Total # of Units	284	40	229	15
Percent of Total	100.0	14.0	81.0	5.0

B. Cost of Providing Infrastructure Services (Annual Average)

	# of Units (000)	Cost[c/] Per Unit	Total Cost (Millions)
Urban	40	Rs. 14,000	Rs. 560
Rural	229	10,000	2,290
Estate	15	14,000[d/]	210
TOTAL	284	-	Rs. 3,060 (US$147)

(See following page for footnotes)

Footnotes for Table 9

a/ Assumes upgrading is undertaken at a rate of 5 percent of the total pool of units per annum.

b/ Source: Raymond Struyk, Housing Needs and Investment in Sri Lanka: 1981 - 2001, January 1983, pp. 10-12. Figures estimate needs to accommodate household growth to replace depreciated housing, to eliminate 1981 crowding and temporary units.

c/ Costs cover provision of water, sanitary facilities, and access roads. Standards are slightly higher regarding provision of water than indicated in Table 7. In particular, these costs assume provision of individual rather than communal wells in rural areas. Costs are expressed in Sri Lankan rupees. One US dollar is equivalent to Rs. 20.80. Source of cost data: PADCO, Meeting Housing Needs in Sri Lanka, October 1982, p. 18, 23.

d/ Costs for the estate sector were assumed to be the same as for the urban sector, since no separate cost breakdown was available.

Adding urban and estate sector estimates to rural investment needs results in total annual requirements on the order of Rs 3,060 million, or US$147 million.

The process of measuring needs can yield several useful results. Projecting investment requirements can provide an order of magnitude approximation of the resources needed to meet government objectives with respect to the provision of residential infrastructure services. Investment targets can then be compared with actual spending plans and estimates of future resource availability. Needs estimates can also help to define the distribution of investment requirements by sector and income level. This can help to focus government programs and target public resources more directly on the areas of greatest need. Estimates of investment requirements, however, can vary as a function of many factors, several of which will be discussed below.

Factors Affecting Residential Infrastructure Service Costs

Standards. The standards implicit in any estimate of needs are a critical determinant of the level of investment required. Table 10 shows comparative costs per capita of alternative types of water supply and sanitation facilities, taking into account the cost differential of providing these services in urban and rural locations. Since the distribution system typically accounts for between 70 to 80 percent of the capital costs of providing an urban water supply system, distribution system alternatives such as the provision of standpipes rather than individual house connections, can lower overall system costs significantly.21/ In rural areas where almost all of the cost of water supply is in the distribution system, the savings potential is even greater.22/ Alternative sanitation technologies also offer great potential

Table 10

TOTAL CAPITAL COSTS PER CAPITA
OF ALTERNATIVE TYPES OF WATER
SUPPLY AND SANITATION
(1978 U.S. $)

Type of Service	Urban	Rural
WATER SUPPLY		
with house connection	120	150
with standpipe	40	40
with hand pumps (i.e. wells)	-	25
SANITATION		
with sewerage	250	250
with septic tank	100	-
with latrine	30	20

Source: As shown in The World Bank, Water Supply and Waste Disposal, Poverty and Basic Needs Series, September 1980, p.16

for cost savings, particularly since conventional sewerage is not necessary to provide a high standard of sanitation.23/ The cost effectiveness of extending electrical lines versus other alternatives, such as auto generators and diesel operated pumps, depends heavily on the level of demand and the length of line extensions required to service population centers.24/ In general, the capital costs of electrification tends to be higher than its alternatives, but energy requirements and maintenance costs are significantly lower. In those locations in which demand is expected to grow and thus, the capital costs can be spread over a wide customer base, electricity is typically the lowest cost alternative.25/ Finally, with respect to local access roads, cost reductions can be accomplished by reducing roadway widths (pathways versus streets) and by limiting the type of base and surface treatment (gravel versus asphaltic surface).

The choice of standards can affect more than the investment costs of various alternatives. For example, selection of a wastewater system will have implications for water use and vice versa. Installation of a waterborne sewerage system in a typical urban residential area can increase water consumption by 50 to 70 percent, since a conventional pipe system needs a minimum of 100 liters per day per capita of water consumption to function properly.26/ Conversely, as individual house connections are provided for drinking water, thereby increasing water consumption, lower cost sanitation alternatives cease to be effective.27/

The choice of technology also affects the level of recurrent costs. Generally, the more complex the system (i.e., the higher the capital cost), the higher the operating and maintenance costs. For example, the average

annual recurrent costs of conventional sewerage or septic tank systems are approximately twelve times greater than the average annual operating and maintenance expenses for low cost technologies.28/ Since operating and maintenance costs are seldom eligible for central government or foreign donor subsidies, these cost differences are critical in determining the financial feasibility of various investment alternatives.

The level of standard selected can also affect the speed of construction. Typically, a lower technology infrastructure system can be built more rapidly than a sophisticated one,29/ although the degree of self help involved in the former can affect the speed of its provision. Thus, the choice of technology can affect the rate of improvement in service provision.

A final point with respect to standards is that the choice does not have to involve an all or nothing decision for many infrastructure facilities. The provision of water, for example, can be approached as a dynamic process. In an urban area, individual house connections can be extended as demand and ability to pay for high level service expands.30/ In the interim, only part of the pipe network with standpipe connections need be installed. Similarly, sanitation system improvements can be phased in over a period of years as population density, water supply, and ability to pay for more sophisticated systems increase.31/ Although several of the sequencing scenarios do not lead to conventional sewerage, they offer an equally high standard of sanitation at much reduced cost.32/

The standards for residential infrastructure services in Sri Lanka, as summarized in Table 7, reflect relatively modest goals. Lower cost options are available, however, particularly with respect to sanitation where communal

facilities could be utilized. The cost implications of lowering service standards are shown in Table 11. Initial needs estimates were recalculated adopting lower service standards and costs. Total investment requirements were reduced accordingly by more than 60 percent to Rs 1,185 million or US$57 million. The most substantial differences are in the rural sector where needs are the greatest.

Geography. The physical characteristics of a country can also have a major impact on the cost of providing residential infrastructure services. An arid climate can substantially increase the costs of providing water if water supplies are limited and have to be transported over long distances. Septic tanks are only suitable in locations with permeable soil. The costs of supplying electricity can vary greatly with the difficulty of terrain and quality of the roads as well as with the distance from bulk supply points.33/ Finally, the costs of providing roads varies greatly with soil conditions and the extent of drainage problems.

In Sri Lanka, geographic constraints do not appear to pose major problems. Water supplies are generally available, although some districts have been identified where water supply facilities are undeveloped.34/ Soil conditions appear to lend themselves to the use of low-cost sanitation technologies. Most localities have access to a power supply, although not always an adequate one.35/ The main constraint to the electrification of Sri Lankan housing units is financial, the inability of large numbers of low income households to afford wiring of residential units and, in some cases, the unsuitability of the units themselves to electrification.

Table 11

RESIDENTIAL INFRASTRUCTURE NEEDS ESTIMATE
BASED ON LOW COST STANDARDS ALTERNATIVE -
SRI LANKA - 1981-2001

A. Quantity of Housing Units Requiring Infrastructure Services (Annual Average)

	Total (000)	Urban (000)	Rural (000)	Estate (000)
# of Units Requiring Upgrading[a/]	47	12	31	4
# of new housing units requiring service[b/]	170	28	136	6
Total # of Units	217	40	167	10

B. Cost of Providing Infrastructure Services (Annual Average)

	# of Units (000)	Cost[c/] Per Unit	Total Cost (Millions)
Urban	40	Rs. 7,000	Rs. 280
Rural	167	5,000	835
Estate	10	7,000[d/]	70
TOTAL	217	-	Rs.1,185 (US$57)

(see following page for footnotes)

Footnotes for Table 11

a/ Assumes the same standards as before for water. Assumes public toilets rather than individual water seal toilets with septic tanks for all sectors. Assumes laterite pathways rather than streets for all sectors.

b/ See Table 9.

c/ Source: PADCO, Meeting Housing Needs in Sri Lanka, October 1982, p. 18, 23.

d/ Costs for the estate sector were assumed to be the same as for the urban sector, since no separate cost breakdown was available.

Population Density. The density of settlements can also affect the cost of infrastructure service provision. In those systems requiring high initial capital costs such as conventional water and sewerage systems and electrification, high population densities can lower per capita investment costs significantly and provide an adequate revenue generating service base. At the same time, however, high population concentrations, particularly in urban areas, can render certain low cost technologies infeasible. Individual pit latrines and pour flush toilets are not viable alternatives when population density averages more than 250-300 persons per hectare for single-story homes and about twice that density for two-story houses.36/

Population densities are low in Sri Lanka. Even in the City of Colombo, average residential densities run about 588 persons per hectare, within the range needed to utilize low cost technologies. In fact, low densities limit the financial feasibility of extending infrastructure systems that require high initial investment costs.

Construction Capacity. The capacity of the local construction industry, both in terms of manpower and materials, can significantly affect the cost of providing infrastructure services. To a certain extent, these factors can be mitigated by encouraging self-help efforts, particularly in rural areas and urban slums.

There are some indications that the capacity of the local construction industry in Sri Lanka may be strained. The government's ambitious development program for housing in the late 1970s, for example, resulted in sharp increases in construction and materials' costs as contractors were stretching themselves thin and more materials were imported to meet demand.37/ Capacity

constraints are clearly a factor that would have to be taken into account in determining the rate at which infrastructure improvements can be accommodated.

FINANCING RESIDENTIAL INFRASTRUCTURE INVESTMENT REQUIREMENTS

Once investment requirements have been estimated, the focus of the analysis can shift to assessing the likelihood of mobilizing resources, both public and private, to meet these needs. If a funding shortfall is indicated, the government can then assess the feasibility of bridging the gap.

Investment by the Public Sector

Overview. As indicated in an earlier section, responsibility for infrastructure provision in Sri Lanka is divided between the central government and local authorities following the British model. At present, there is no systematic structure of capital grants from the central government to local authorities to finance infrastructure improvements. (Revenue grants, however, are provided by the central government to local authorities, a portion of which could be utilized for maintenance purposes.) Local authorities, whose major infrastructure responsibilities are in extending distribution networks, must either generate resources internally from taxes and charges, or borrow, to finance needed capital improvements.[38/]

Central Government Infrastructure Investments. The central government finances infrastructure improvements in two ways - first, through large scale

investment projects in water supply, power generation and transmission, irrigation, ports and airports, many of which receive foreign donor support, and second, through the provision of residential infrastructure facilities as part of government- financed housing programs.

Large-Scale Infrastructure Supply Projects. The provision of many residential infrastructure services - piped water, electricity, local access roads - depends on the availability and adequacy of supply sources. The government's investment record suggests that much of this basic infrastructure is already in place, or will be completed shortly.

Since 1978, investment in water supply has been substantial, reflecting, in part, growing foreign donor interest in the sector. Currently, there are Rs. 4,659 million (US $224 million) externally assisted water supply projects underway, with facilities planned for nearly every major population center.39/ Water supply projects are expected to average 5.7 percent of planned capital investments over the 1982-1986 period, although investment levels are expected to taper off in the later program years.40/ The high priority given to water supply investments, particularly in urban areas, appears warranted given the inadequacies reflected in the most recent census with respect to the provision of piped water.

The largest share of planned public expenditures continues to be earmarked for power and irrigation investments. The heavily foreign assisted Mahaweli program, which involves irrigation and resettlement projects as well as several major hydro-electric plants, is expected to require nearly one-third of planned public investments over the next five years.41/ Additional power projects, to improve the transmission needs arising from the major

Mahaweli power investments, are expected to require another 6.5 percent of budgetary resources.42/ Once the three major power generating projects of the Mahaweli program are completed (completion is now slated for 1986), electrical generating capacity should be adequate to meet demand. Currently, all local authorities have access to a power supply, but power shortages are frequent.

Public investment for highways is projected for slightly over 1 percent of total investment requirements over the next five years.43/ According to a World Bank analysis of the capital budget, a disproportionate share of highway expenditures are being devoted to development of the new capital complex at Kotte, neglecting highway improvement and maintenance needs in the rest of the island.44/

Provision for Cost Recovery. Adequate provision of infrastructure supply not only depends on the initial investment, but also on the continued supply of funds for operations and maintenance and for needed system improvements. Both water supply and power projects lend themselves to charges for the provision of service, thereby creating a sustainable revenue base. Sri Lanka's record of cost recovery, however, is poor.

Direct charges for water and sewerage are non-existent so that, with increasing investment in new supply projects, operating and maintenance cost burdens are mounting. Tentative projections show that these costs will nearly triple between 1983 and 1985, requiring increased subsidies from the central government.45/

Sri Lanka's record of cost recovery is better in the electricity sector. The Ceylon Electricity Board has implemented 3 tariff increases since 1978,

providing internal funds for operations and maintenance and for the local share of its continuing investment program. Although the CEB has collected these revenue increases from its direct customers, local authorities, which purchase bulk electricity from the CEB, have not passed along these tariff increases and are thus in arrears on their payments. Instead, the central government has chosen to make up the difference through subsidy payments to the CEB, adding to the strain on overall budgetary resources.

Without stronger cost recovery measures, the central government will not only face growing budgetary pressures, but will also jeopardize its ability to maintain and extend existing supply systems.

Residential Infrastructure/Housing Projects. The central government also provides infrastructure facilities as part of its housing programs. The Ministry for Local Government Housing and Construction (MLGHC) has primary responsibility for housing in Sri Lanka. Under this Ministry, the National Housing Development Authority (NHDA) was established in 1979 as the primary implementing agency for government housing programs.46/ The one exception is the slum and shanty upgrading program (which will be described later) which falls under the jurisdiction of the Urban Development Authority, although the program is funded by NHDA.

The Government of Sri Lanka made a substantial commitment to the improvement of housing conditions and associated residential infrastructure services under the leadership of the current Prime Minister and his "100,000 Housing Program" launched in 1978. Public funds were earmarked for direct construction of 50,000 rural units, where needs are greatest, 36,000 urban

units, and for housing loans for the remaining 14,000 units.47/ The majority of these units were to be targeted for low-income households.

The infrastructure services provided as part of this effort vary considerably by specific housing program. The major rural initiative, the Aided Self-Help (ASH) Program, provides modest infrastructure facilities - communal wells, individual water seal toilets with septic tanks and laterite streets - and building material loans to eligible low and moderate income households.48/ The Slum and Shanty Upgrading Program is restricted to infrastructure improvements only for existing housing in poor urban areas. Minimum service standards are provided - standpipes, public toilets and shower facilities, roads and footpaths.49/ To date, the units upgraded under this program represent only a fraction of the total. The major urban housing initiative is the Direct Construction Program. Accompanying residential infrastructure facilities are built to high service standards -- individual piped water and sewer, electrical connections, paved streets and sidewalks, and landscaping50/ -- standards far out of reach of the urban poor.

Since the housing initiative began in 1978, over one-third of the planned 100,000 units have been completed.51/ Cost increases, however, both in labor and materials, particularly for the Direct Construction Program created an unsustainable burden on public funds, given competing claims for budgetary resources. Housing investment levels were cut back accordingly to 5.3 percent of total capital spending in 1982 from 11.7 percent a year earlier.52/ Over the next 5 years, housing investment levels are expected to average 3.8 percent of total planned public investments.53/ Major shifts in program direction accompanied these changes. The high cost Direct Construction

Program has been abandoned, leaving the Slum and Shanty Upgrading Program as the only urban housing initiative. Under the current level of activity, this program will only reach 10 percent of the slum and shanty areas in Colombo.54/ The rural ASH Program has now become the cornerstone of the government's public housing efforts.

Affordability and Cost Recovery. Provision of residential infrastructure services through national housing programs has involved heavy subsidies, with limited targeting to the lowest income groups. Units available under the Direct Construction Program are affordable only by families in the upper 20 percent of the income distribution, and financing costs to these families are heavily subsidized through below-market interest loans.55/ The financing package available through the rural ASH Program is affordable to target low and middle income families, but involves deep subsidies.56/ Further reductions of standards and increasing cost recovery, particularly for middle income program recipients, may be necessary to insure program continuation. The Slum and Shanty Program is 100 percent subsidized, but here program funds are all targeted to low income households.57/ In the future, cost recovery measures may have to be introduced if program coverage is to be adequate to meet slum and shanty upgrading needs.

Local Authority Infrastructure Investments. In addition to infrastructure investments made by the central government, local authorities are responsible for financing many residential infrastructure services, such as the extension of water and electric power lines, sanitation facilities and local road improvements.

As in many other LDC's, the property tax is the major revenue source for local authorities. The central government, however, has not permitted a general revaluation of the tax base since the early 1970's. Moreover, any increase in the tax rate requires ministerial approval and must be justified in terms of improved service provision. In effect, Sri Lankan local authorities have been operating under their own version of Proposition 13, with the result that limited funds are available to finance infrastructure improvements.

The situation is only made worse by limited reliance on user fees. Direct charges for water service are practically non-existent. Provision of water is supported through the property tax system with all of the limitations mentioned above. Rates are charged for electricity service but failure to pass along rate increases at the local authority level and poor collection records hamper cost recovery efforts.

Admittedly, user charge systems and cost recovery efforts are not always easy to implement. The type of technology utilized can affect the feasibility of user fee arrangements. Where water supplies are provided through communal standpipes, for example, rather than by individual house connections, a tariff structure based on individual consumption is not possible. Flat-rate charges - a head tax or a family fee - can be levied as an alternative.58/

Customer income levels can also affect ability to pay. In urban areas, where the income range is generally wide and where substantial revenue may be generated by commercial and industrial customers, low income users can effectively be subsidized. A minimal life-line rate can be charged for a low level of consumption set at an amount adequate to meet minimum health

requirements.59/ Similar cross subsidization is less feasible in rural areas where the income differential is less and non-residential users are few. However, by utilizing low cost and low maintenance technologies and employing self-help measures in constructing rural systems, cost recovery opportunities can be found.60/

Easing central government controls on local revenue raising capacity and strengthening the institutional capacity of local authorities to manage those infrastructure services which fall under their jurisdiction may be critical to protect central government investments. With strengthened finances and institutional capability, local authorities should be in a better position to ensure that existing infrastructure facilities are well maintained and that service extensions can be provided. If the central government is firmly committed to adequate cost recovery measures, then opportunities for private sector operation of facilities or joint venture arrangements may be another feasible alternative.

Private Investment Potential

Residential infrastructure services can be financed not only by direct government investment, but also by the expenditures of private households. A rough approximation of total private investment potential was calculated using data developed in an earlier study.61/ For purposes of illustration, it was assumed that households would expend up to 7 percent of their income on the provision of residential infrastructure services.62/ Following in part the methodology of the earlier report, this expenditure stream was capitalized into a single value and applied to the average annual number of new units requiring service and existing units needing upgrading to arrive at a total

estimate of average annual private infrastructure investment potential. This figure was then compared with the total needs' estimates derived previously (see Table 9) to determine the investment shortfall. The specific calculations are contained in the Annex.

The results of the analysis show that, on average, Rs 549 million will be available annually from private sources to purchase infrastructure services (see Table 12). This compares with total estimated annual average investment needs of Rs 3,060 million, leaving an annual shortfall of Rs 2,511 million. The majority of the shortfall can be attributable to the rural sector, an expected result since the majority of needs (in terms of quantities of units) and the lowest income levels are concentrated in rural areas.

The quality of the analysis could be improved considerably with more information on household income by housing type and on household expenditure patterns. The former would allow a more precise determination of the income potential of those households in units requiring upgrading. The latter would result in a more accurate estimate of the spending potential available for residential infrastructure. The analysis is also hampered by the fact that no provision is made for household income growth over the period. This is offset, to some extent, by assuming a zero inflation rate in the cost of providing infrastructure services. To the extent that growth in household income lags growth in construction prices, the analysis presented here may overstate private investment potential.

The main purpose of the analysis, however, is not to provide a precise quantification of private investment potential, but to develop an order of magnitude projection, so that the government can assess the approximate size

Table 12

PROJECTED PRIVATE INFRASTRUCTURE
INVESTMENT LEVEL COMPARED WITH
TOTAL SPENDING NEEDS - ANNUAL AVERAGE[a/]

A. Private Spending Potential (1980 Rupees)

	Total (000)	Urban (000)	Rural (000)	Estate (000)
Households in Units Requiring Upgrading	Rs 126,908	Rs 19,706	Rs 93,418	Rs 13,783
Households in New Units	421,876	106,124	297,024	18,728
Total households, all units	Rs 548,784	Rs 125,830	Rs 390,442	Rs 32,512

B. Total Infrastructure Investment Requirement

	(000)	(000)	(000)	(000)
High b/	Rs 3,060,000	Rs 560,000	Rs 2,290,000	Rs 210,000
Low c/	Rs 1,185,000	Rs 280,000	Rs 835,000	Rs 70,000

C. Investment Shortfall

	(000)	(000)	(000)	(000)
High	Rs 2,511,216	Rs 434,170	Rs 1,899,558	Rs 177,488
Low	Rs 636,216	Rs 154,170	Rs 444,558	Rs 37,488

a. See Annex 1 for more detailed calculations.
b. Figures taken from Table 9.
c. Figures taken from Table 11.

of the shortfall that will have to be financed from public funds. If residential infrastructure services are to be provided within the current 20-year timeframe and at the minimum service standards defined by the government (see Table 7), then 80 percent of the financing, or Rs 2,511 million annually, will have to come from government subsidies for the foreseeable future. Expenditure levels of this magnitude would consume approximately 13 percent of planned public capital investments over the next five years.63/ Severe budgetary pressures have already forced the Government of Sri Lanka to curtail its ambitious housing program from 13 percent of total capital spending in 1979 to a planned 3.8 percent of all public investments over the 1982 to 1986 period.64/ And public expenditures on housing include more than provision of residential infrastructure facilities.65/ Thus, it appears likely that the government will be forced to consider alternative investment strategies.

POLICY OPTIONS

The preceding analysis provides a framework for analyzing various government policy options with respect to the provision of residential infrastructure. Following the logic of the government's current objectives has been shown to require a level of public investment more than triple the amount of planned expenditures over the next five years. Several alternative investment strategies are available. To illustrate one option, if infrastructure service standards were reduced to the level outlined in Table 11, the

funding shortfall would shrink by nearly three quarters, from Rs 2,511 million to Rs 636 million (see Table 12). Government subsidies would be needed to finance slightly more than 50 percent of total infrastructure investment requirements, requiring approximately 3 percent of planned capital investments over the next 5 years. This reduction would bring the provision of residential infrastructure services in line with government spending targets.

The full range of strategy options are outlined below:

- Increase the Level of Public Expenditures to Meet Spending Requirements. In essence, this would mean going back to a more massive commitment of public funds for housing and residential infrastructure purposes at the expense of other capital needs. The obvious problem with this approach is that these other needs frequently represent higher priority, more productive investments than housing and the provision of residential infrastructure.

- Cut Public Spending Requirements. This can be accomplished in two ways: by lowering infrastructure service standards and/or by stretching out the time frame over which the improvements are to be implemented. As the previous analysis has shown, there are opportunities for reducing standards, even in the already modest rural sector housing program. The largest opportunity exists in the urban sector now that the high standard Direct Construction Program has been terminated. Stretching out implemention goals can reduce spending, but lessens the likelihood of reaching improvement targets as population growth increases needs.

- Target Public Spending More Effectively and Increase Cost Recovery Measures to Insure Replicability. Public spending should be targeted on those projects with the greatest likelihood of economic pay-off. For example, where supplies are adequate, water and electric power lines should be extended in areas with good potential demand to lower high fixed investment costs by spreading them over a wide customer base and to enhance the general revenue generating capacity of the system. Public subsidies should be reserved for the poorest segments of the population and cost recovery measures should be introduced on a scale graduated to income levels to insure that investment funds can continue to be sustained for needed improvements.

- Increase the Level of Private Spending to Meet Investment Needs. This would involve macro-economic measures to stimulate GNP and household income growth. The government would encourage a greater level of private savings and would develop the financial institutions needed to provide private investment financing.

- Strengthen Institutional Arrangements and Capacity to Provide Infrastructure Services More Efficiently. Several alternatives are possible. Central governmental controls on local revenue raising capacity could be eased and local authority institutional arrangements strengthened to improve the management and financing of infrastructure improvements at the local level. Opportunities for private sector operation or joint venture arrangements could be pursued if the central government is serious about improving cost recovery efforts.

Clearly, these options do not have to be considered in isolation from one another. In practice, a mix of strategies is likely to be employed such as reducing standards, stretching targets, restructuring institutional arrangements, and stimulating private investment. The purpose of the analytic framework is to provide a means of estimating the likely effect of each of these strategy changes.

PROJECTED ANNUAL AVERAGE PRIVATE INFRASTRUCTURE INVESTMENT COMPARED WITH ANNUAL AVERAGE NEEDS TOTAL

(Rs 1980)

	Urban	Rural	Estate	TOTAL
Upgrading				
Median Household Income (Rs)[a]	460	350	429	
Effective Infrastructure Expenditure @ 7% [b]	32.2	24.5	30.03	
Capitalization Factor[c]	51	41	51	
Capitalized Value of Infrastructure Expenditure	1,642.2	1,004.5	1,531.53	
# units requiring upgrading (000)[d]	12	93	9	
TOTAL PRIVATE INFRASTRUCTURE	19,706	93,418	13,784	126,908
New Units				
Median Household Income (Rs)[e]	833	600	686	
Effective Infrastructure Expenditure @ 7% [b]	58.31	42	48.02	
Capitalization Factor[c]	65	52	65	
Capitalized Value of Infrastructure Expenditure	3,790.15	2,184	3,121.3	
# new units required (000)[d]	28	136	6	
TOTAL PRIVATE INFRASTRUCTURE INVESTMENT POTENTIAL (Rs 000)	106,124	297,024	18,728	421,876
TOTAL PRIVATE INFRASTRUCTURE INVESTMENT POTENTIAL FOR UPGRADING UNITS AND FOR NEW UNITS (Rs 000)	125,830	390,442	32,512	548,784
TOTAL INFRASTRUCTURE INVESTMENT REQUIREMENT (Rs 000)				
• High[d]	560,000	2,290,000	210,000	3,060,000
• Low[f]	280,000	835,000	70,000	1,185,000
INVESTMENT SHORTFALL (Rs 000)				
• High	434,170(17%)	1,899,558 (76%)	177,488 (7%)	2,511,216 (100.0%)
• Low	154,170(24%)	444,558 (70%)	37,488 (6%)	636,216 (100.0%)

Footnotes for Annex 1

a. Bulk of units requiring upgrading are semi-permanent and improvised structures. Income of households living in these units was assumed to be in the bottom 40th percentile. Median monthly household income for this income class was derived from the monthly household income distribution table cited in Raymond Struyk, Housing Needs and Investment in Sri Lanka: 1981-2001, January 1983, Annex, p.5, Table A.2.

b. Many reports use as a working assumption that no more than 5 percent of household income should be required for water and sanitation services. For the purposes of these estimates, the 5 percent figure was inflated to 7 percent to take into account other infrastructure service provision such as access roads.

c. Capitalization factors corresponding to income distribution assumptions were derived from Table A.3, Annex, Raymond Struyk.

d. Figures taken from Table 9.

e. Households requiring new units were assumed to be at the median income level. Median monthly household income figures were derived from the same table cited in footnote a.

f. Figures taken from Table 11.

FOOTNOTES - SRI LANKA

1/ PADCO, Meeting Housing Needs in Sri Lanka: A Strategy for the Future, October 1982, p.26.

2/ W. Paul Strassmann, The Transformation of Urban Housing, Baltimore and London: The Johns Hopkins University Press, 1982, pp. 117-120.

3/ His analysis suggests that provision of indoor piped water nearly doubles the value of a dwelling unit. Ibid., pp. 85-87.

4/ Emmanual Jimenez, "The Magnitude and Determinants of Home Improvements in Self-Help Housing: Manila's Tondo Project," Land Economics, vol. 59, No.1, February 1983, pp. 70-83.

5/ PADCO, Meeting Housing Needs in Sri Lanka, p. 23.

6/ PADCO, pp. 20-22.

7/ Johannes F. Linn, Cities in the Developing World, Oxford University Press, 1983, p.162.

8/ Tonly Key, Urban Infrastructure in the U.K.: Preliminary Review, CES Limited, June 1983, pp. 7-12.

9/ These local governments consist of 74 local authorities in urban areas and 24 Development Councils in rural areas.

10/ The District Development Councils which have responsibility for providing local government services in rural areas were recently established (in 1979).

11/ The estate sector refers to those who live on plantations. Information was not available from the census on the quality of road access for housing units.

12/ See Table 19, p.66, in the housing tables, Census of Housing and Population - Sri Lanka, 1981, for more details.

13/ See Table 4, p.29 for district breakdowns from the housing tables.

14/ Water Supply and Sanitation Sector Study, World Health Organization/World Bank Cooperative Program, June 1978, p.4.

15/ This information may be contained in the Labor Force and Socio-Economic Survey of 1980-1981, but the data was not readily available.

16/ See discussion on pp. 4-5 of census housing tables.

17/ This was the timeframe used in the study of Housing Needs and Investment in Sri Lanka: 1981-2001 (which included residential infrastructure investments) conducted by Raymond Struyk in January, 1983.

18/ This number can also include new units required to eliminate crowding and to replace temporary dwelling units.

19/ The other study on Meeting Housing Needs in Sri Lanka was conducted by PADCO in October, 1982.

20/ Needs are expressed as an annual average over the 20-year planning horizon.

21/ The World Bank, Water Supply and Waste Disposal, Poverty and Basic Needs Series, September 1980, p.16.

22/ In rural areas, treatment and long transmission lines are often unnecessary.

23/ John Kalbermatten, Appropriate Technology for Water Supply and Sanitation, Technical and Economic Options, The World Bank, 1980, p.114.

24/ Dennis Anderson, Appraising Rural Electrification Investments in Developing Countries, unpublished report, April 1982, pp. 10-11.

25/ Ibid., p.12.

26/ Appropriate Technology for Water Supply and Sanitation, p.36 and Water Supply and Waste Disposal, p.8.

27/ The threshold point where a conventional sewerage system becomes essential is reached as water consumption nears 200 liters per day per person in a relatively dense urban environment. Source: Water Supply and Waste Disposal, p.8.

28/ Appropriate Technology for Water Supply and Sanitation, Table 3-3.

29/ PADCO, The National Urban Policy Study, Working Paper on Urban Development Standards and Costs, October 30, 1980 p.3.

30/ Waste Supply and Waste Disposal, pp. 18-19.

31/ John Kalbermatten, pp. 110 - 114.

32/ Kalbermatten compared the costs of three upgrading schemes involving low cost technologies with the costs of immediate construction of a conventional sewerage system. Cost differentials were as much as ten to one for the conventional system as opposed to the low cost sequencing alternatives.

33/ Anderson, p.2.

34/ These districts are Kandy, parts of Matale, Badulla, Nuara, Eliya, Vavuniya and Moneragala. Evidently, these areas were not developed in the colonial period and thus require heavy initial investments in drilling wells, transporting water and restoring reservoirs. Source: Susil Sirivardana, Sri Lanka Country Monograph, July 1982, p.31.

35/ Capacity should increase significantly upon completion of the major hydro-electric projects under the accelerated Mahaweli program.

36/ Pit latrines have been found to provide satisfactory service at much higher population densities, however. Source: Kalbermatten, p.22.

37/ The National Savings and Loan League, Shelter Sector Assessment, Sri Lanka, January 1981, p. 185, 211.

38/ Local Authority borrowing is restricted to loans from the Local Loans and Development Fund (LLDF) for self-supporting public utility projects. Since LLDF is in turn, dependent on the Government of Sri Lanka for its funds, budgetary pressures have limited its loan capacity.

39/ The World Bank, Survey and Analysis of Multi- and Bilateral Aid to the Water and Sanitation Sector in Sri Lanka, September 1982, p.2.

40/ Economic Adjustments in Sri Lanka, p.51, 122-126.

41/ Ibid., p. 51.

42/ Ibid., p. 51.

43/ Ibid., p. 122, 126

44/ Ibid., p. 54.

45/ Ibid., p. 52-53. O&M subsidies of Rs. 128 million will be needed in 1983 and are estimated to grow to Rs. 352 million by 1985. Of the 19 externally-assisted projects now underway, a World Bank Survey found that 13 made no estimate of future operating and maintenance costs and only 2 attempted to relate the community's ability to pay water rates to recovery of at least the costs to sustain the system.
Source: The World Bank, Survey and Analysis of Multi- and Bilaterial Aid to the Water and Sanitation Sector in Sri Lanka, p.3.

46/ National Savings and Loan League, Sri Lanka Shelter Sector Assessment January 1981, pp. 109-113.

47/ PADCO, Evaluation of Housing Programs of Sri Lanka, October 1982, p. 2, 12.

48/ Ibid., p.2. Provision of electricity in rural units is a separately funded activity. Source: Shelter Sector Assessment, p.121.

49/ PADCO, p.8; Shelter Sector Assessment, p.149.

50/ PADCO, Evaluation of Housing Programs of Sri Lanka, p.13.

51/ Ibid., p. 2, 7, 12.

52/ The World Bank, Economic Adjustment in Sri Lanka, Issues and Prospects, p.48.

53/ Ibid., p.51.

54/ PADCO, Evaluation of Housing Programs of Sri Lanka, p.11.

55/ Ibid., p. 14

56/ Ibid., p. 6.

57/ Ibid., p. 11.

58/ Village Water Supply, a World Bank Paper, March 1976, p.12.

59/ The World Bank, Water Supply and Waste Disposal, p.33.

60/ Ibid., p.35.

61/ Ray Struyk, Housing Needs and Investment in Sri Lanka, 1981-2001, The Urban Institute, January 1983, pp. 14-19, Annex.

62/ A frequently quoted figure is that households, particularly poorer households, should not spend more than 5 percent of their income on water and sanitation services. Since the provision of local access roads was also included as part of the infrastructure service package in calculating investment requirements, 2 percentage points were added to the 5 percent spending figure to reflect spending for this purpose.

63/ The World Bank, Economic Adjustments in Sri Lanka: Issues and Prospects, May 27, 1982, Public Investment Program for 1982-1986, p.51.

64/ Ibid.

65/ The exception is the provision of electricity which is not included under the "housing" category.