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DRINKING WATER DELIVERY SYSTEM

IN

URBAN SLUM SETTLEMENTS :

STATUS, DEVELOPMENT STRATEGY & ACTION PLAN

VINAY D. LALL

JANUARY 1991

SOCIETY FOR DEVELOPMENT STUDIES

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Sponsored By
CPHEEO, MINISTRY OF URBAN DEVELOPMENT
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SOCIETY FOR DEVELOPMENT STUDIES
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The Society for Development Studies (SDS) is an autonomous non-profit institution, which undertakes research, consultancy work and manpower development programmes in areas which have a bearing on the quality of human life. These include, among others human settlement, public health, resource mobilisation, informal sector and public policy.

The SDS has been closely involved in research and training and providing advisory services to governments on different aspects of the urban informal sector. These activities received an impetus when the Ministry of Urban Development, Government of India established the Informal Sector Centre for Research, Information, Policy & Training (INSCRIPT) in the SDS in 1989. The present study, sponsored by the Central Public Health and Environmental Engineering Organisation (CPHEEO) of the Union Ministry of Urban Development, provided an ideal opportunity to examine in depth one of the basic urban service components of a human settlement upgradation programme in the urban informal sector.

The study was undertaken partly as a fallout of the 1988 water-borne epidemic in Delhi and also as a result of the UNCHS Global Shelter Strategy and the International Drinking Water Supply and Sanitation Decade, which brought into focus the need to formulate specific policies for developing the drinking water delivery system as part of a total human settlement development programme. The basic objective of the study was to assess the pattern of water consumption in urban slum settlements, both at the household and the micro enterprise level and, on that basis, to recommend the type of delivery system and interventions by governments and other agencies to meet the national targets of water consumption, suggested in recent years by expert commissions and Missions.

The study is based on primary data generated in selected slum settlements in Delhi, Ghaziabad and Hyderabad covering households as well as micro enterprises. In such a study, the support from public agencies is critical to develop the requisite data base and also have an insight into the field level situation and perspective of the policy framework at the sectoral level. A number of government officials provided the requisite support. These include, among others, P.S.A. Sundaram, V.Venugopalan and B.V. Rama-prasad from the Ministry of Urban Development, Government of India, who provided the national perspective. At the town level, S.P. Agarwal, Manjit Singh and A.C. Seth provided an insight into the Delhi slum settlement scenario. M.Pitchaiah, M. Samual, D. Prakashan and T.Papiah, on the Hyderabad scenario and P.N. Mishra and S.C. Gupta on the Ghaziabad situation. K.K. Bhatnagar and A Arunachalam from the National Capital Region Planning Board provided professional expertise on some of the issues covered in this study.

A team of SDS researchers conducted the study. The project was conceived, data analysed and report drafted by Vinay D. Lall. The surveys were organised .and conducted by Sunita Sharma, with the support of local researchers and investigators whose names are listed separately. She also developed a questionnaire and did the pre-survey testing of the same, was in overall charge of data processing and provided analytical notes on the slum settlements and water supply situation in the survey towns of Delhi, Ghaziabad and Hyderabad. Christopher Cecil edited the report. Secretarial support was provided by Sanjay Goel P.M. Augustine and Soma Das and Sandip Garg looked after the production of the Report.

The Governing Body of the Society does not take the responsibility for the views expressed in the Report. The responsibility for the conclusions arrived at, belong to the staff of the Society and,more particularly, to the author of the Report.

New Delhi   Vinay D. Lall
January, 1991   Director

DRINKING WATER DELIVERY SYSTEM IN URBAN SLUM SETTLEMENTS :

STATUS, DEVELOPMENT STRATEGY & ACTION PLAN

CONTENTS

List of Tables

List of Charts

x

I. INTRODUCTION AND METHODOLOGY

1. Water and Sanitation Sector Scenario

An important component of the UNCHS Global Shelter Strategy is the development of basic infrastructure and amenities for the habitat. Provision of drinking water, sewerage and sanitation forms a high priority input in shelter upgradation programmes. To quote the UNCHS Global Shelter Strategy document (p.46) : "Provision of water supply and sanitation services in adequate quantities will be a key input to the production and improvement of shelter." The document further observes (p.46) :"Infrastructure provision, particularly for low-income informal settlements, can also improve general levels of health, thus reducing or, at least, stabilising public-health expenditure."

The significance of adequate potable water for the health of the community, particularly low-income households in urban slums, was dramatically evident in the 1988 cholera epidemic in Delhi. This tragedy highlighted the gross inadequacy of potable water in informal slum settlements in the country which house mainly the low-income and under-privileged segments of the society. At the same time, the neglect of water needs of this segment of the urban population by the Government in planning and investment allocation also became evident.

Inadequate and unhygienic water supply has been a perennial problem in Indian cities and a major factor responsible for periodic water-borne epidemics. Even in normal times, supply of potable water through the public distribution network in some of the metros is irregular and limited. The National Commission on Urbanisation (NCU) has pointed to the stark realities on the water front in Madras and Hyderabad, where daily supply of piped water is restricted to 20 minutes in summer and many locations in these cities fail to receive even this supply for a prolonged period. To quote the NCU (p.698) :"In much of Tamil

Nadu and in large parts of Andhra Pradesh, especially in large
cities such as Madras and Hyderabad, the water sources are
totally inadequate to meet the demands of even the domestic
sector, with the result that there is very limited piped supply
and substantial recourse to alternative sources on an individual
or community basis." The NCU further adds that "Even in the
capital city of Delhi there have been major water constraints
and in many of the suburbs, the water supply is either inadequate
or of very poor quality. In most of the older urban centres,
the supply systems are well past their normal age-span and
require major overhaul."

The potable water scenario in urban areas has deteriorated
over the last two decades as investments in relation to growing
needs have been marginal. The Seventh Plan has allocated a mere
1.6 per cent of total outlay to the water and sanitation sector.
Hence, even though it is stated in official documents that 81.0
per cent of urban population is covered by some form of protec-
ted water supply, the data do not reflect the inadequacy of
water supply or the deprivation of the urban poor.

An examination of investment data on urban infrastructure
sector brings out the stark neglect of water production and
delivery in development schemes. No investment in new schemes
has been made in recent years, and water needs of the fast-
growing informal sector households are not taken into account.
There have not been also any major investment for improving
existing water supply schemes. The Government of West Bengal,
for example, had represented to the NCU, that almost the entire
distribution system of Calcutta required replacement. The poor
maintenance level has increased the incidence of water pollu-
tion, as is evident during outbreak of water-borne diseases.
The Seventh Five Year Plan, thus states (p.304) :"The high
rate of incidence of death and disease in urban poor settlements

can be attributed largely to the poor quality of water and
sanitation facilities."

A major constraint that arises when policy-makers, planners
and other experts have to consider policies to extend services
like drinking water and basic infrastructure to low-income
households, who may reside/work in slum and squatter settle-
ments, as well as to determine investment allocations, is the
non-availability of reasonably authentic data and information
on water needs and water consumption pattern, and also on issues
like the capacity to pay for the services. Furthermore, as
no provision exists for water supply for commercial and indus-
trial use in the informal sector settlements, valuable potable
water gets diverted to such uses. An assessment of non-potable
water needs of this segment of the population becomes crucial
for formulating a viable water management policy. In this
context, the NCU suggestion to curb and minimise wastage in
the water distribution system, including misuse, is extremely
relevant.

In the perspective of the draft National Housing Policy,
which aims to raise the quality of life of the underprivileged
groups in the society, it becomes crucial to examine the salient
aspects of the supply of potable water and formulate group-
specific policies that would stimulate need-based investment
in water supply schemes for informal sector settlements, minimise
leakages in the distribution system and also the probability
of water-borne epidemics.

2.   Objectives of Study

It was in this perspective that the Ministry of Urban
Development, Government of India requested the Society for
Development Studies (SDS) to undertake an assessment of the
drinking water problems and needs of urban slum households in
selected slums and review the official policy initiatives taken

in this direction by the Government and public agencies. The
Ministry desired the study to be done on the basis of case
studies of selected slums in three cities, namely, Delhi,
Ghaziabad and Hyderabad.

The major objectives of the study are :

1. To assess the needs of water for drinking, sanitation
   and other purposes by households in the informal
   settlements;

2. To assess the needs of non-potable water for commercial
   and industrial use by economic units in the informal
   settlements;

3. To study the type of households and economic units
   that reside/operate in the informal settlements, so
   as to assess their affordability to pay for water and
   related services;

4. To develop a methodology to build a data bank that
   will provide inputs for monitoring and evaluating
   programmes and formulating sectoral development
   policies; and

5. To recommend policies to improve the supply of potable
   and non-potable water in the informal settlements.

3.   Framework of Report

The report is presented in six chapters. This intro-
ductory chapter spells out the objectives of the study, the
data base and methodology. A review of the slum settlements
in the sample cities of Delhi, Ghaziabad and Hyderabad is
presented in Chapter 2. The empirical evidences generated

through the surveys in the sample towns are presented in Chapters 3 to 5, together with an analysis of the policy implications. These relate, among others, to socio-economic profile of SDS sample households, pattern of activities of economic units, assessed water needs for a variety of purposes like drinking, bathing, washing clothes, commerce and industry, cost of using water and affordability of the households. The final chapter presents a summary of the major results and policy recommendations.

4.   Need for Primary Data Base

Data and information on the supply of drinking water to urban slums are not included in the official data base as squatter settlements (hereinafter referred to as "slums" or "slum settlements") invariably fall outside the purview of operations of the local public water supply system. Limited information is available in some cases on sources of supply of water to slums but mainly on the basis of observations, unsubstantiated by data. On many critical issues relevant for formulating a drinking water strategy, even observation-based information is not available. These include the average household water consumption and needs, pattern of water consumption, methods of payment for use of water, affordability to pay for official supply of water, etc.

The UNCHS has recently identified two performance parameters relating to drinking water, among the several Performance Indicators that it is formulating for the evaluation of shelter sector programmes under its Global Shelter Strategy. The proposed drinking water indicators are :

    a. Proportion of housing units out of total housing stock
        with access to safe (clean or treated) drinking water
        ⁻either from a fountain, well, water supply network or
        other safe drinking water supply sources;and

b. Proportion of housing units out of total housing stock with individual domestic water connection like piped water or a private drinking water source like well, fountain, etc.

A related issue on which the UNCHS proposes to develop performance indicators is toilet facility, namely, proportion of housing units with shared toilet and percent of housing units with individual toilet.

Available census data on the proposed UNCHS performance indicators are at a level of aggregation that does not permit an assessment of the situation at the level of urban slum settlements. The present study provides some data on these issues in three sample cities as well as develops a model questionnaire and survey programme which may be used to build a data bank on issues relevant for formulating, evaluating and monitoring drinking water and related programmes in urban slum settlements.

5. Methodology

The SDS data for this study were generated through a well structured and tested questionnaire-based interaction with sample households in selected slum settlements. The study methodology envisaged the inclusion of different categories of informal and marginal household clusters, keeping in view the local level situation. As per the suggestion of the Public Health Engineering Research Committee, Ministry of Urban Development, Government of India (PHE Research Committee), which sponsored the study, an attempt was made to cover, to the extent possible, the following types of clusters in each sample city namely:

a. Jhuggi Jhopri (JJ) clusters, where little or no basic services are provided by a public agency;

b. Unauthorised colonies, where no basic services are
   available;and

c. Resettlement colonies where some basic services are
   provided.

The research methodology envisaged the assessment of the
problem on the basis of case studies of sample households and
economic units in the selected informal sector/slum settlements.
Discussions were held with local officials of the concerned
slum department/housing agency and residents in the city to
identify the important slums falling under category 'a', 'b'
and 'c', following which the sample slum locations were deter-
mined. As no census of such households and units is available,
an attempt was made, in the first instance, to list all house-
holds and units in a pre-determined part of the slum. At the
second stage, a sample was selected from the predetermined census
of households and economic units. Purposive random sample
methodology was used to capture all types of major economic
activities and categories of households in the sample slum
clusters.

The primary data base was, thus, developed on the basis
of a survey of households and economic units or micro enter-
prises. The household surveys covered, among other things, the
socio-economic profile of the informal sector household settle-
ment and its drinking water and sanitation needs, problems
and affordability to pay for the services. For the economic
units, data were generated on the entrepreneur's profile and
future growth plans and an assessment made of potable and non-
potable water needs, present supply sources, costs and financial
conditions and capacity of the unit to pay the prices normally
charged for use of the public water supply facilities.

The research methodology also envisaged a qualitative
assessment of the problems through discussions with policy-

makers, local officials, community leaders and researchers who were familiar with the drinking water and slum settlement issues in the survey cities.

6.   SDS Sample

As per the suggestion of the PHE Research Committee, the following three cities were selected for the study:

1. Delhi,
2. Ghaziabad, and
3. Hyderabad

On the basis of discussions in the PHE Research Committee, the target sample size was fixed at 1,050 households and 200 economic units in the selected slum settlements in the three cities. The actual SDS sample is presented in Table I.1.

Table I.1 :Composition of SDS Sample Households

		Households								Economic Units
		A		B		C				
		N	P	N	P	N	P.	Total	P	
1.	Delhi	123	30.8	143	35.8	134	33.4	400	100.0	75
2.	Ghaziabad	150	60.0	100	40.0	-	-	250	100.0	50
3.	Hyderabad	232	58.0	89	22.3	79	19.7	400	100.0	75
	Total	505	48.1	332	31.6	213	20.3	1050	100.0	200

Note   A - Jhuggi Jhopri (JJ) cluster
        B - Unauthorised colony
        C - Resettlement colony
        N - Number
        P - Percent

The thrust of the survey is on the undeveloped slum
settlements, which account for 48.0 per cent of SDS sample
households :30.8 per cent in Delhi, 60.0 per cent in Ghaziabad
and 57.5 per cent in Hyderabad. The relatively lower coverage
in Delhi is due to major housing activities in resettlement
colonies where some basic services are being provided and in
unauthorised colonies. There are no resettlement colonies
in Ghaziabad.

II : <u>SLUM SETTLEMENTS AND WATER DELIVERY SYSTEM</u>

1.   <u>Review of Slum Settlements</u>

The SDS sample slum settlements in Delhi, Ghaziabad and Hyderabad represent a slum scenario which may be considered to be fairly representative of the socio-economic profile and living and work place environment of the urban poor in India. The settlements can be considered to be almost a mini-India, representing various social customs and practices, languages and modes of living. An analysis of the SDS sample composition is presented in this chapter together with a brief elucidation of some of the major programmes, policies and initiatives of public agencies in the sample cities.

a. <u>Delhi</u>

The SDS sample covers slum clusters in all the four parts of the Union Territory, as can be seen in Table II.1.

Table II.1 : <u>Locations of SDS Sample Households in Delhi</u>

	Jhuggi Jhopri Cluster	Unauthorised Colony	Resettlement Colony	Total
1. North	Sarai Pipar Thala 31	Kamruddin Nagar 36	Shakarpur 33	100
2. East	Sundar Nagri 30	Mandavali Fazalpur 36	Gokul Puri 34	100
3. West	Kathputli Colony 31	Mohan Park 35	Raghuvir Nagar 34	100
4. South	Bhoomihin Camp 31	Sangam Vihar 36	Tigri 33	100
TOTAL	123	143	134	400

Note : The figures relate to number of sample households in each location.

The SDS sample micro enterprises are located in Vishwas Nagar and Wazirpur.

Three of the four sample JJ clusters (1,2,4) emerged during the latter half of the seventies. The majority of residents are from Eastern Uttar Pradesh and Bihar, and a small mix from Haryana and Rajasthan. Most of them are daily wage workers at construction sites or in informal economic units, while some are self-employed in activities such as rickshaw pulling and trading. The basic characteristic of these households, from the point of view of their economic status, is the fluctuation in incomes, closely linked to seasonal variations in economic activities or in demand for the goods and services provided by them.

The fourth JJ cluster, Kathputli Colony, was formed by a group of puppet makers and performers, who migrated from Rajasthan in the mid-sixties and the cluster subsequently attracted other migrants from this community. The cluster presently accommodates about 1,500 jhuggies and the majority of the residents earn their livelihood from their traditional craft. While the puppet shows are held mainly in schools and social functions, some of the artistes have had an opportunity to perform abroad, in the Festival of India held in the USA, France and USSR.

The total household size of the four JJ clusters included in the SDS sample is estimated at around 7,000 of which 123 households or 1.8 per cent, constitute the SDS sample.

The unauthorised colonies are a significant feature of the Delhi urban scenario. These colonies are developed without any formal approval of the planning authorities and often developed on agricultural land. They do not necessarily conform to Government regulations relating to FSI. They have no formal

access to public services though many do manage to avail of these services. A number of unauthorised colonies, which have permanent structures, get regularised periodically.

Several unauthorised colonies are located on prime land. in the central part of the city. The structures are largely permanent. Many of these housing units have arranged access to formal public services. These prime-land-located unautho-rised colonies have been excluded from the SDS sample. The SDS sample of four unauthorised colony clusters is located on agricultural land on the fringes of the city.

The residents in the unauthorised colonies constitute the better-off segment of the SDS sample households. They are mainly working in the formal sector employment market or in relatively established business activity that ensures regular income flows. A small proportion of the households are engaged in agricultural activities and possess large land holdings.

The SDS sample of unauthorised colonies have about 1,500 to 2,000 plots in each cluster. Occupancy is partial mainly because an estimated 50.0 per cent to 60.0 per cent of the plots have been acquired by estate agents, for speculative gains. The 1989 market rate in these clusters ranged between Rs. 500 and Rs. 700 per square yard as against a mere Rs. 5 to Rs. 10 per square yard in the early seventies.

As the unauthorised colony clusters have no legal status, public infrastructure like roads, drinking water, sewage disposal, schools, and electricity are not available. The main source of drinking water is either a tubewell or handpump. Some of the better-off households, who have been able to develop appropriate linkages with the functionaries of public agencies, have access to piped water through an underground connection with the main water source along the road. Initial capital investment for such a connection is around Rs.1,000 to Rs.1,500

and regular maintenance costs have to be borne for keeping the water supply intact. Other households pay exorbitant rates for obtaining water from the private water supply market.

- The source of electricity is also illegal, involving hazardous tapping directly from the nearest transmission pole. This requires a regular operational cost, the beneficiary of which is invariably a field-level functionary of the Delhi Electric Supply Undertaking (DESU).

Interaction with the residents indicated an eagerness to pay for water and other services to the public agency simply because the effective burden would be lower than at present, the supply would be less uncertain and erratic and official-level harassment would be, hopefully, eliminated.

The prime responsibility for improving the quality of life, which includes supply of potable water and sanitation facilities, in the slum settlements in Delhi is vested in the Slum Wing of the Delhi Development Authority. A distinct shift in its development strategy is seen in the last few years. Prior to the Seventh Five Year Plan, the stress was on clearance of slums. Thus, about 15 years ago, the slum clearance programme shifted slums from prime locations in the city to new locations, regarded as a considerable distance at that time. While provision was made to supply some basic infrastructure and amenities like potable water through hand pumps, public toilet, street lighting, schools, health services, proper by-lanes, etc. the supply was most inadequate. Now the stress is on upgradation of environment in slums located on land that is unlikely to be required in the near future.

The rationale for this change in policy and approach is that the task of slum clearance is too colossal to be accomplished through existing financial and physical resources.

There is also a growing realisation of the close linkages of
the slum and formal populations and economic activities, on
the one hand, and non-availability of vacant land near slum
areas to accommodate evictees of slum clearance programmes
near their place of work, on the other.

The environment upgradation scheme envisages provision
of various facilities including water supply, sewers, storm
water drains, community latrines and bathrooms in Pay and Use
Jansuvidha complexes, widening and paving of existing lanes,
dhalaos, street lights, multi-purpose community halls, etc.
Upto end of October 1989, this programme has covered 14.5 lakh
slum dwellers. A similar environment improvement programme is
operated to improve the environment in jhuggi clusters for
more than 12 lakh dwellers in over 2 lakh jhuggis spread in
about 600 jhuggi clusters and basties. The facilities include
Pay and Use Jansuvidha complexes with toilets and bathrooms
at community level, water supply through water hydrants or
deep handpumps depending upon availability of water from the
municipal mains along with drains from water posts to outfall,
street lights, dustbins and paved pathways and drains. As of
now, about 7.0 lakh jhuggi dwellers have been covered.

There is a high incidence of sale of resettlement units
by the original allottee. It is estimated that about two-
third of the present occupants are not the original allottees.

b. <u>Ghaziabad</u>

The proximity to Delhi (20 kms) has influenced the pattern
of slums in Ghaziabad, a growing urban centre, with a large
group of small and medium-sized manufacturing and trading
enterprises. An important indicator of its growth and economic
development is the price of land, which has spurted manifold
in the last two decades :Rs. 50 to Rs. 70 per square yard in
1971 to Rs. 800 to Rs. 1,000 per square yard in 1990.

The main concentration of JJ clusters is on prime land
owned by the Ghaziabad Development Authority (GDA) in the heart
of the town, along the railway tracks. There are also some
JJ clusters on land owned by the Ghaziabad Municipality.

A significant feature of Ghaziabad slums is that they
are mainly of recent origin, as compared to Delhi and Hyderabad.
Until 1987-88, the migrants who normally develop slum settle-
ments had no fixed location. GDA used to evict them when the
land was required for its own programmes and they had no
obligation to provide an alternative site. In the SDS sample,
therefore, one slum cluster only is more than 10 years old and
the other two are between two and five years old.

The majority of the slum residents are from the neighbouring
rural areas, though there are also some migrants from Madhya
Pradesh, Bihar, Eastern Uttar Pradesh and Rajasthan. All the
residents came to Ghaziabad in search of economic opportunities
and are largely engaged as daily wage workers on construction
sites or self-employed as rag pickers. Some of the residents
in the JJ slum settlements have taken up street vending and
hawking activities. As such, income flows in the settlement
are not regular and exposed to sharp seasonal variations. Women
in these settlements have limited income earning opportunities,
with only a small proportion being able to get daily wage jobs
as construction workers or domestic servants.

The unauthorised colonies in Ghaziabad have developed on
lines similar to those in Delhi. The process of regularisation
of these colonies is, however, more systematic. Pipe lines were
laid in the two SDS sample unauthorised colonies in 1987-88 and
several houses have obtained piped water connections. Hand
pumps, nevertheless, continue to be the main source of water.

No policy has so far been evolved to develop resettlement colonies by shifting slum residents in JJ clusters to new developed locations, as in Delhi and Hyderabad. The local authorities have not yet taken cognisance of the reality of slum settlements.

c. Hyderabad

Hyderabad has evolved a comprehensive slum upgradation and renewal programme. The slum population grew significantly from the latter half of the seventies. A 1979 survey by a High-Power Committee of the Government of Andhra Pradesh estimated that the number of slums in the twin cities of Hyderabad and Secunderabad had increased from 284 with a population of 0.3 million in 1972 to 377 (population 0.4 million) in 1977 and 455 (population 0.5 million) in 1979. Informal estimates provided during SDS discussions with the Urban Community Department (UCD) of the Hyderabad Municipal Corporation place the number of slum settlements in 1990 at 700-725, with an estimated population of 0.9 million. The slum population is, thus, 23.0 to 25.0 per cent of the estimated total population of Hyderabad (4.2 million) in 1990.

The Hyderabad slum population is heterogeneous, roughly one-half belonging to scheduled castes and schedules tribes and the other half including Hindus, Muslims and Christians, mainly migrants from neighbouring districts. The majority language is either Telugu or Urdu.

The working population in Hyderabad slums consists mainly of unskilled workers on construction sites and in small manufacturing enterprises. There are also some self-employed people like rickshaw pullers, push-cart vendors and those engaged in repair and servicing activities and manufacturing and processing

work, very often on a contract job basis. There are also some
household and industrial workers. Women are mainly engaged
as domestic servants and coolies but there is a high rate of
unemployment among the women.

The availability of basic infrastructure amenities is
sporadic. The officially estimated supply of water to Hydera-
bad is 90 million gallons/day, the sources being the Manjira
River (43 mn gallons/day), Usman Sagar (25 mn gallons/day) and
Himayat Sagar (22 mn gallons/day). Major water treatment
plants are located at these sites and the city's water distri-
bution network includes 15 water supply zones. As per the policy
of the State Government of Andhra Pradesh, 15.0 per cent of
water sector plan outlay is directed towards supply of drinking
water to scheduled castes and tribes and other backward seg-
ments of the population.

The Overseas Development Agency (ODA) of the British
Government is providing technical and financial assistance to
the Hyderabad Water Supply and Sewerage Board since 1983-84
to improve the water supply and sanitation conditions in the
slums of Hyderabad. The ODA financial assistance is channelled
through the UCD of the Hyderabad Municipal Corporation, which
identifies the slums to be taken up for phased development. In
the initial year, 1983-84, 210 slum clusters were identified
for the first phase of the programme. Interest-free housing
loans were provided to all these slums through HUDCO finance
and Rs. 12 crore grant from the ODA.

The SDS survey team observed during a visit to some of
the sites where the first phase programme has been implemented,
that basic civic services are now available, developed mainly
through the community's initiatives and efforts. These services
include water supply through community taps, public toilet,
street lighting, and public health centres, which were provided

by the UCD but are now managed and maintained by the community. While inadequate supply of water was brought out by the residents the fact that conditions were far better than in undeveloped slums was clearly evident. In 'fact, the residents showed willingness to pay if services like water supply were improved.

In the second phase of the slum improvement programme, 300 slum clusters have been selected in 1989-90. ODA funding is estimated at Rs.25 crore.

An important feature of the Hyderabad slum development strategy is the development of the slum (slum improvement or upgradation strategy) at its existing site through large-scale community participation. This is in contrast to the erstwhile Delhi strategy of slum clearance and shifting/relocation and the no-policy apathy, _per se_, in Ghaziabad.

The SDS·sample of Hyderabad slum households covers some of the developed slums but the majority are from the non-developed slums, where there has been no provision so far for drinking water and sanitation facilities. One or two public taps were found to be servicing 500-800 households in these slum clusters.

2.   Water Supply System : Delhi Experience[1]

a. Evolution of Delivery System

The Delhi Water Supply and Sewage Disposal Undertaking (DWSSDU) of the Municipal Corporation of Delhi (MCD) has the responsibility of providing safe water and sewerage services to the entire Union Territory of Delhi. It supplies water in bulk to the New Delhi Municipal Committee (NDMC) and the Delhi

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1.   Based primarily on unpublished information provided by
      Delhi Water Supply and Sewage Disposal Undertaking

Cantonment Board (DCB) and directly in the MCD areas through a network of catchment areas, reservoirs, artesian wells, pumping stations and distribution mains. The system has evolved over a period of almost a century. In olden days, the main source of water was shallow wells, which dried up in summer and were inadequate and often polluted. The first development initiative was made in 1889, when several wells were dug up in Chandrawal and water was supplied through a reservoir built at the Ridge. The next major development coincided with the coming up of New Delhi and Cantonment and the Ridge reservoir system was replaced by direct drawal of raw water from the Yamuna river at Wazirabad and carried by gravity through masonry conduits at Chandrawal for treatment in sand filters.

In 1926, the Delhi Joint Water and Sewage Board was set up for efficient supply of water and sewage disposal. To meet the increasing needs of the growing population of Delhi and New Delhi, water works at Wazirabad and Chandrawal were later expanded and a barrage was constructed in 1959 across the Yamuna river, near Wazirabad, to store water. Additional intake works and treatment plant were constructed subsequently at Okhla in South Delhi, Ranney wells sunk in Shahdara and tube-wells installed in South Delhi and West Delhi to augment the supply of water in these parts of Delhi.

The increase in population of Delhi also increased the need for providing sewerage facilities and treatment of sewage effluent. The sewerage system started soon after New Delhi was built and a sewerage farm was established near Kilokri Village where pumped sewage was used for irrigation. Later, the sewerage farm was abandoned and a sewage treatment plant of 82 MLD capacity was constructed in 1938 at Okhla and the capacity was increased to 164 MLD by 1956. A sewage treatment plant was commissioned at Coronation Pillar in North Delhi with a capacity of 91 MLD in 1957 and another plant was built at Keshopur in West Delhi with a capacity of 54 MLD in 1960.

With the coming into force of the Delhi Municipal Corporation Act, 1957, the Delhi Joint Water and Sewage Board ceased to exist and its functions were taken over by the Delhi Water Supply and Sewage Disposal Undertaking of the Corporation (DWSSDU). One of the obligatory functions of the Municipal Corporation relates to water supply and sewage disposal. The Act provides for a Committee of the Corporation, namely, the Delhi Water Supply and Sewage Disposal Committee which is responsible for the operations and management of the DWSSDU.

b. <u>Present Status</u>

As at present, there are 48 underground reservoirs having total capacity of 402.39 ML and 54 overhead tanks with total capacity of 82.13 ML. The delivery system is facilitated by 123 boosting stations dispersed over the Union Territory. To further improve and to rationalise the distribution system, a computer-based study was undertaken by DWSSDU, which recommended the construction of 22 ground reservoirs along with boosting arrangement & strengthening of the trunk transmission system at various locations.

To strengthen the distribution system, water mains from Wazirabad and Chandrawal water plants have been laid upto Flag Staff, Jhandewalan, Palam and M.M. Reservoirs. Work of construction of ground reservoirs with boosting arrangements has been taken up at Khyala, Geeta Colony, Deer Park, Subhash Park, Janak Puri, Bodela, Idgah, Punjabi Bagh, Model Town and Peeragarhi. The first four ground reservoirs have been completed and commissioned and the others are likely to be completed and commissioned during 1990-91. Action has also been initiated for construction of ground reservoirs at Najafgarh, Keshopuram, Shastri Nagar, Mehrauli, Alipur and Sanjay Gandhi Transport Nagar.

The present potable water production in Delhi is around 440 MGD against an assessed requirement of 540 MGD (on basis of 60 gallons per capita daily for estimated population of 90 lakh) and the demand is expected to further rise to 900 MGD by 2001 for an estimated population of 128 lakh. Delhi has not been, however, able to run the existing water treatment plants at Wazirabad and Chandrawal for regeneration of water supply as not enough raw water is available. Under an informal agreement between Punjab and UP in 1954, the entire water of the river, upstream of Tazewala is diverted by the two States (UP and Haryana) for irrigation purpose through the Eastern and Western Yamuna Canal leaving the river dry below Tazewala Headworks. The National Water Policy has accorded priority to drinking water needs over irrigation needs and in that perspective, due share of Yamuna water will have to be ensured for Delhi. The underground water in Delhi is mostly brackish and not fit for drinking purpose.

c. Priority to Slum Settlements

The DWSSDU has accorded highest priority to supply of water to vulnerable areas like resettlement colonies, unauthorised/regularised colonies, harijan basties and JJ clusters inhabited by weaker sections of the society. Water supply has been installed in the resettlement colonies and unauthorised/regularised colonies during 1988 and 1989. Out of 543 unauthorised/regularised colonies, water supply has been extended to about 500 colonies. It has been decided to make safe drinking water available to residents of all unauthorised colonies and extended abadies of villages through deep bore hand pumps, tubewells and also by providing public hydrants wherever feasible. All unauthorised colonies which came into existence prior to January 1, 1981 will also be supplied drinking water on regular basis on payment of development charges.

d. Operational Problems

Wastage of water through leakages in the distribution system   is a major problem, estimated at 20.0 per cent of total supply. There are invisible leakages in the distribution system service pipes, reservoirs, etc., which do not come above the surface. The DWSSDU has set up a Leak Detection Cell, equipped with electronic instruments and trained personnel for detection of hidden leakages.

Conservation of filtered water in Delhi is given high priority. Use of filtered water in industries and for watering of lawns and parks is being reduced gradually by sinking more tubewells and using treated effluents. All local bodies and group housing societies have been advised to sink tubewells for their water needs for lawns and parks.

Table II.2 presents data on water production capacity and actual production in 1990 through the various plants and Table II.3 presents the trends and projections of population, average water supply and per capita daily water availability between 1951 and 2001, as per the estimates provided by Delhi Water Supply and Sewage Disposal Undertaking.

Table II.2 : <u>Water Capacity and Production in Delhi, 1990</u>

	Plant	Production Capacity (MGD)	Actual Production	
			MGD	MLD
1.	Wazirabad	80	85	385
2.	Chandrawal	90	100	455
3.	Haiderpur	100	105	476
4.	Bhagirathi	100	110	500
5.	Ranney Wells and Tubewells	47	40	182
	TOTAL	417	440[1/]	1998

Note : 1. Against requirement of 540 MGD on basis of daily per capita water consumption of 60 gallons for a population of 90 lakh.

Source : Delhi Water Supply and Sewage Disposal Undertaking

Table II.3 : <u>Delhi Population and Water Supply : Trends and Projections, 1951-2001</u>

Year	Population (lakh)	Average Supply (MLD)	Per Capita Daily Availability (Litres)
1951	17.50	190	108
1961	26.50	440	166
1971	41.00	785	190
1981	62.00	1150	185
1990	88.00	2160	245
1995	105.00	2860	272
2001	128.00	3520	275

Source : Delhi Water Supply and Sewage Disposal Undertaking

III.   SOCIO-ECONOMIC PROFILE OF SAMPLE HOUSEHOLDS

1.   Basic Issue

Development of an operational strategy based on the principle of capacity to pay for public services is constrained when data and information on parameters that facilitate assessment of this capacity are not available. Even though human settlement in the urban informal sector is among the fast-growing components of the housing stock and the economy, no serious attempt has been made to develop a comprehensive data base that could help to assess the affordability and capacity of the residents to pay for public services. Several misconceptions, therefore, prevail in the absence of grassroot level data, among which are, a feeling that the urban poor living and working in slum settlements have no capacity to pay for public services, will receive the public services only on "no-payment" basis and are keen to exploit illegal avenues to obtain access to public services. A point of view is also expressed at times, including at high-level policy discussions, that the urban poor do not mind, or are indifferent to. living in unhygienic conditions, on the ground that their desperate need is to secure a shelter unit, irrespective of the environment and services.

SDS studies in several parts of the country and covering different aspects of the urban informal sector settlements have brought out the necessity of socio-economic data to understand the genesis of the problems and appreciate the thinking of the concerned people. These data and their correct reading are basic inputs for formulating policies and schemes that are more likely to fit into the needs and absorbing capacity of the target group than the presently operating schemes, which are found to contain elements that suggest a significant mis-match between what the people want and what is provided by the public agencies.

2.   Household Composition and Characteristics

The important characteristics of the SDS sample households
that have a bearing on their drinking water requirements and
capacity to pay for water supply services are :

    a. Type of household;
    b. Size of household;
    c. Age of head of household;
    d. Education status of head of household; and
    e. Occupation of head of household.

The most significant determinant of the water needs and
consumption of a subject household is its size, as total water
consumption (not per capita consumption) is universally consi-
dered to be positively related to the number of members that
constitute the household. The consumption pattern and quantum
would, however, also be influenced by other parameters and some
on which data can be generated through household surveys are the
level of literacy, education and income (as indicated by that
of.the head of household), and age composition of the household.
It is often felt that water consumption will be higher in
households with larger number of children, who are prone to
waste water, particularly in slum settlements, where for lack
of other recreational outlets, playing with water, when availa-
ble, and especially in the summer months, is a common pastime
Data on age of the head of household and its type together
provide a quick insight into the composition of the household
in terms of elders and children. Household type data would
indicate, a priori, the water consumption pattern in the con-
text of the understandably different needs of small nuclear
households as compared to that of large joint households.

SDS data on a few salient characteristics of the 1050
sample households are presented in Tables III.1 to III.3 for
the three cities, viz., Delhi, Ghaziabad and Hyderabad, as well

as for the aggregate for the three cities. These data are at
three levels of disaggregation in terms of type of settlements,
namely, jhuggi-jhopri cluster (JJC), unauthorised cluster (UAC)
and resettlement colony (RSC).

a. Size of Household

There is no significant variation in the average size of
households in the three survey cities as well as in the diffe-
rent types of settlements, the average ranging from 5 to 6
members. The average is higher in Delhi (5.7-5.8 members in each
type of cluster) and lower in Hyderabad where the average size
of household is 5 members in UAC and RSC and 5.7 members in JJC.
In the case of Ghaziabad, there is no resettlement colony and
the average size is almost identical in the JJC (5.5 members)
and UAC (5.6 members) (Table III.1).

As can be expected, the average household size is smaller
for nuclear households 5.3 members) as compared to joint house-
holds, where the average size ranges from 7 to 8 members for
different categories of settlements in the three cities.

b. Type of Household

In line with the pattern of urban households in the
country, the majority of the households in the slum settle-
ments are of a nuclear type. For the SDS sample as a whole,
87.1 per cent of the households are nuclear, with the maximum
proportion in Hyderabad (94.8 per cent). In Delhi and Ghazia-
bad, the number of households in the SDS sample which can be
classified as nuclear are 83.5 per cent and 80.8 per cent,
respectively. (Table III.1).

c. Age of Head of Household

The age distribution of the head of household, who was
also the respondent in the SDS survey, brings out characteristics

Table III.1:   Type and size of SDS Sample Households

		Nuclear			Joint			Total		
		No.	Percent	Size (No.)	No.	Percent	size (No)	No.	Percent	size (No.)
1.	Delhi									
	a. JJC	107	87.0	5.1	16	13.0	8.4	123	1J0.0	5.5
	b. UAC	115	80.4	5.3	28	19.6	7.9	143	100.0	5.8
	c. RSC	112	83.6	5.6	22	16.4	6.7	134	100.0	5.8
	d. TOTAL	334	83.5	5.4	66	16.5	7.6	400	100.0	5.7
2.	Ghaziabad									
	a. JJC	121	80.7	5.1	29	19.3	7.1	150	100.0	5.6
	b. UAC	81	81.0	5.4	19	19.0	6.4	100	100.0	5.6
	c. RSC	–	–	–	–	–	–	–	–	–
	d. TOTAL	202	80.8	5.2	48	19.2	6.8	250	100.0	5.5
3.	Hyderabad									
	a. JJC	217	93.5	5.6	15	6.5	7.7	232	100.0	5.7
	b. UAC	87	97.8	4.9	2	2.2	5.0	89	100.0	4.9
	c. RSC	75	94.9	5.1	4	5.1	5.5	79	100.0	5.1
	d. TOTAL	379	94.8	5.3	21	5.2	7.0	400	100.0	5.4
4.	Total									
	a. JJC	445	88.1	5 3	60	11.9	7.6	505	100.0	5.6
	b. UAC	283	85.2	5.2	49	14.8	7.2	332	100.0	5.5
	c. RSC	187	87.8	5.4	26	12.2	6.5	213	100.0	5.5
	d. TOTAL	915	87.1	5.3	135	12.9	7.2	1050	100.0	5.5

NOTE: JJC :Jhuggi Jhopri Cluster, UAC: Unauthorised Colony , RSC:Resettlement Colony

typical of the working class. More than 90.0 per cent of the
SDS respondents are in the active working age group, 26 to 55
years, the maximum being in the very active 26 to 40 years
age group. Thus, the sample includes 69.6 per cent households
in the 26-40 years age group and 21.3 per cent in the 41.55
years age group. The proportion of households having a rela-
tively old head of household, above 55 years of age, is only
1.2 per cent in the SDS sample cities taken together, with
2.0 per cent in Delhi and less than 1.0 per cent in Ghaziabad
and Hyderabad. (Table III.2).

This age structure brings out a relatively middle age
group profile of the head of household, average age range
being 34-38 years in the individual sample cities and 36 years
for the SDS sample as a whole. The average age is on the
higher side in Delhi (37 years in JJC, 38 years in UAC and
39 years in RSC).

The mid-age group profile of the head of household in
the urban informal settlement, and the concentration of nuclear
families having on the average 5 members, suggest that the
majority of the members of the households are children and very
few members are engaged in income-generating activity. This
characteristic of the households comes out from the data on
earning members. The 1050 SDS sample households have a total
of 1174 earning members. In other words, not more than 124
households or 11.8 per cent of the SDS sample, have a second
earning member. These data also suggest that affordability
to pay for urban services will have to be largely determined
by the level of income of the head of household. The low work
participation rate of adult household members needs examination.

d. Education Status

The education status of the head of household in the SDS
sample is in line with the pattern in other parts of the

Table III·2 : Distribution of SDS Sample Respondents by Age Groups

(Age Group in Years)

	Upto 25			26-40			41-55			55 Plus			Total		
	No.	Percent	Av.Age	No.	Percent	Av.Age	No.	Percent	Av.age	No.	Percent	Av.Age	No.	Percent	Av. Age
I. Delhi															
a. JJC	11	8.9	24	77	62.6	34	30	24.4	47	5	4.1	59	123	100.0	37
b. UAC	10	7.0	24	81	56.6	33	51	35.7	47	1	0.7	70	143	100.0	38
c. RSC	5	3.7	25	76	56.7	34	51	38.1	47	2	1.5	60	134	100.0	39
Total	26	6.5	24	234	58.5	34	132	33.0	47	8	2.0	61	400	100.0	38
II. Ghaziabad															
a. JJC	21	14.0	24	92	61.3	33	35	23.3	46	2	1.4	60	150	100.0	35
b. UAC	13	13.0	24	68	68.0	33	19	19.0	45	-	-	-	100	100.0	34
c. RSC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	34	13.6	24	160	64.0	33	54	21.6	46	2	0.8	60	250	100.0	35
III Hyderabad															
a. JJC	6	2.6	25	186	80.2	34	38	16.4	45	2	0.8	60	232	100.0	36
b. UAC	8	9.0	25	81	91.0	35	-	-	-	-	-	-	89	100.0	33
c. RSC	9	11.4	20	70	88.6	35	-	-	-	-	-	-	79	100.0	33
Total	23	5.7	23	337	84.3	34	38	9.5	45	2	0.5	60	400	100.0	34
TOTAL															
a. JJC	38	7.5	24	355	70.3	34	103	20.4	46	9	1.8	60	505	100.0	36
b. UAC	31	9.3	24	230	69.3	34	70	21.1	46	1	0.3	70	332	100.0	35
c. RSC	14	6.6	23	146	68.5	34	51	23.9	46	2	1.0	60	213	100.0	34
Total	83	7.9	24	731	69.6	34	224	21.3	46	12	1.2	60	1050	100.0	36

NOTE: JJC : Jhuggi Jhopri Cluster , UAC: Unauthorised Colony , RSC: Resettlement Colony

-29-

country. In the JJC, more than four-fifth of the households
belong to the illiterate or semi-literate category. However,
the proportions in this category are considerably small in
the RSC and UAC. Contrary to expectations, the literacy level
is much lower in Hyderabad than in Delhi and Ghaziabad.(Table III.3)

This situation has arisen as the majority of inhabitants
in Hyderabad slum clusters are recent migrants from Telengana
and other neighbouring rural areas, who have migrated to
Hyderabad in the last 5 to 10 years. They are still in the
process of locating permanent shelter, whereas the residents
in Delhi and Ghaziabad slum settlements have been living in
their present location for a considerable period, generally
more than 15 years. They have had time to get exposed to some
level of formal education. The NGOs also have played a rela-
tively more active role in Delhi, as compared to Hyderabad,
in promoting education, among other things.

The preponderance of illiterate or semi-literate house-
holds suggests that a water conservation programme will have
to be promoted through the audio-visual media rather than
through the print media. Similarly the computation of water
charges and the collection system will have to be very simple,
with minimum paper work and maintenance at the level of the
household, documents or proofs of payment, etc.

It is interesting to find that 7.2 per cent of the SDS
households had exposure to some college education, particularly
in Delhi and Ghaziabad and the proportions are reasonably high
in the UAC of Delhi and Ghaziabad and also the RSC of Delhi.
There is hardly any evidence of technical and professional
education in the SDS sample households.

Table III.3 : <u>Educational Status of SDS Sample Households</u>

	Illiterate/Semi-literate		Upto Primary level		High School level		College Level		Technical/ Professional Education		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
1. Delhi												
JJC	92	74.8	18	14.6	11	9.0	2	1.6	-	-	123	100.0
UAC	27	18.9	31	21.7	52	36.4	31	21.7	2	1.3	143	100.0
RSC	45	33.6	34	25.4	35	26-1	20	14.9	-	-	134	100.0
Total	164	41.0	83	20.8	98	24.5	53	13.2	2	0.5	400	100.0
2. Ghaziabad												
JJC	97	64.7	24	16.0	18	12.0	11	7.3	-	-	150	100.0
UAC	48	48.0	17	17.0	24	24.0	11	11.0	-	-	100	100.0
RSC	-	-	-	-	-	-	-	-	-	-	-	-
Total	145	58.0	41	16.4	42	16.8	22	8.8	-	-	250	100.0
3. Hyderabad												
JJC	218	94.0	10	4.3	4	1.7	-	-	-	-	232	100.0
UAC	83	93.3	5	5.6	1	1.1	-	-	-	-	89	100.0
RSC	54	68.3	16	20.3	8	10.0	1	1.3	-	-	79	100.0
Total	355	88.7	31	7.8	13	3.3	1	0.2	-	-	400	100.0
4. TOTAL												
JJC	407	80.6	52	10.3	33	6.5	13	2.6	-	-	505	100.0
UAC	158	47.6	53	16.0	77	23.2	42	12.6	2	0.6	332	100.0
RSC	99	46.5	56	23.5	43	20.2	21	9.8	-	-	213	100.0
Total	664	63.2	155	14.8	153	14.6	76	7.2	2	0.2	1050	100.0

Note : JJC - Jhuggi Jhopri Cluster   UAC - Unauthorised Colony   RSC - Resettlement Colony

3.   Economic Profile

The most important parameter to assess the economic status of the household is the level of income. The source of income and occupation pattern provide an additional insight into fluctuations in income flows and also facilitate assessment of the potential income flows that have a bearing on affordability to pay for public services. The income-earning period and trends in income flows in recent years strengthen the assessment that can be made on the basis of only monthly income data.

a. Monthly Income

The average monthly income of SDS households living in the urban slum settlements is Rs. 885. There is a sharp disparity in the income level, related to the sectoral source of income flows. The average monthly income is higher in the formal sector labour market and economic activity, at Rs. 1,418, than in the informal labour market and economic activity, namely Rs. 828. However, less than 10.0 per cent of the households are engaged in formal sector activities and hence the average household income of SDS household is Rs.885. .

The income levels are considerably higher in the case of households living in the UAC as compared to the RSC and JJC. The disparity is sharper for households engaged in informal sector activities, as can be seen from Table III.4.

The household members, other than the head of household, make a marginal contribution to total household income. Only 4 of the 102 SDS households which earn an income in formal activities have another earning member in the household and the 948 households that earn an income in the informal sector have 120 other members who contribute to the household income.

Table III.4 : <u>Monthly Income of SDS Sample Households</u>

	JJC			UAC			RSC			TOTAL		
	No.	Amount (Rs.00)	Average income (Rs.)	No.	Amount (Rs.00)	Average income (Rs.)	No.	Amount (Rs.00)	Average income (Rs.)	No.	Amount (Rs.00)	Average income (Rs.)
I. Formal Sector												
1. Respondent												
a. Male	16	172	1075	58	826	1424	28	417	1490	102	1415	1387
b. Female	-	-	-	-	-	-	-	-	-	-	-	-
c. Total	16	172	1075	58	826	1424	28	417	1490	102	1415	1387
2. Other Members												
a. Male	-	-	-	2	12	600	1	12	1200	3	24	800
b. Female	-	-	-	1	7	700	-	-	-	1	7	700
c. Total	-	-	-	3	19	633	1	12	1200	4	31	775
3. Total 1c+2c	16	172	1075	58	845	1456	28	429	1532	102	1446	1418
II. Informal Sector												
1. Respondent												
a. Male	483	3325	688	272	2332	857	182	1545	849	937	7202	769
b. Female	6	23	383	2	14	700	3	17	567	11	54	491
c. Total	489	3348	684	274	2346	856	185	1562	844	948	7256	765
2. Other Members												
a. Male	46	269	584	14	152	1056	7	59	843	67	480	716
b. Female	47	92	196	5	15	300	1	5	500	53	112	211
c. Total	93	361	388	19	167	879	8	64	800	120	592	493
3. Total 1+2 [1]/	489	3709	758	274	2513	917	185	1626	879	948	7848	828
III. Total I.1 + II.1	505	3520	697	332	3172	955	213	1979	929	1050	8671	826
I.2 + II.2	93	361	388	22	186	845	9	76	844	124	623	502
TOTAL HH Income I.3 + II.3	505	3881	769	332	3358	1011	213	2055	965	1050	9294	885

NOTE: Inclusion of other earning members does not change total number of households.

JJC :Jhuggi Jhopri, UAC :Unauthorised Colony, RSC :Resettlement Colony

- 33 -

Not only is the proportion of households with a second earning member low (3.9 per cent and 12.7 per cent, respectively, for households earning income from formal and informal activities), but the average income of the other income-earning members is less than that of the main earning member.

There is a sharp variation in the incomes of female as compared to the male member of the household. 11 heads of household in the SDS sample are women and they earn an average monthly income of Rs.491 from some economic activity or employment in the informal sector, whereas the average for their male counterpart is Rs.769 (56.6 per cent higher). Other female members of households deriving income from the informal sector earn an average monthly income of Rs.211 whereas, their male counterpart has an average monthly income of Rs.716. This pattern is seen in all the cities and categories of urban settlements in the informal sector. Female incomes are highly depressed as compared to male income, both of the head of household and other earning members (Table III.4).

b. Occupation. Pattern

The occupation profile suggests a pattern of irregularity and uncertainty in income flows of informal sector households. 45.7 per cent of the SDS households are self-employed, 26.2 per cent are employed on daily wage basis and 26.7 per cent are employed on regular basis, though it is likely that a considerable proportion of the last category may be employed on casual though not necessarily on daily wages basis. The self-employment and daily wage employment sectors play an even more prominent role in the JJC (covering 51.5 per cent and 31.3 per cent of households, respectively) and a comparable proportion though less in RSC (41.8 per cent and 23.9 per cent of the households, respectively). These two employment avenues

together constitute three-fifth of the SDS households in
the UAC (Table III.5).

Among the three survey cities, the self employment and
daily wages employment market is the predominant component of
the economic base of urban informal sector settlements in
Hyderabad, where 93.2 per cent of the head of households are
either self employed or work on a daily wage basis. In Ghazia-
bad, the proportion is lower at 66.0 per cent and still lower
in Delhi (54.2 per cent).

Table III.5 presents the occupation profile of SDS
sample households in the different types of urban informal
settlements in Delhi, Ghaziabad and Hyderabad.

c. Income Period

The SDS data on income-earning period of households in
the urban informal sector settlements, however, suggest a quite
steady flow of income, contrary to the scenario that emerges
on analysis exclusively of data on sources of income flows.
Thus, almost one-half of the households have been engaged in
an income-generating activity for more than 10 years and another
29.0 per cent for a period ranging from 6 to 10 years. Another
one-fifth of the households have been earning an income for
more than a year but less than 5 years. Only 1.0 per cent
have been in the income earning category for less than a year.

This pattern is evident in all the types of settlements
and survey cities. It is, however, most prominent in Delhi,
where 72.2 per cent of the SDS households have an income-
earning period of more than 10 years and another 18.7 per cent
have been earning for more than 6 years. In Ghaziabad, 78.4
per cent of the households have an income-earning period of
more than 6 years and 53.6 per cent more than 10 years. It is
in Hyderabad that only 22.0 per cent have an income-earning

Table III.5 :   Occupation Pattern of SDS Sample Households

Occupation	JJ Cluster			Unauthorised Colony			Resettlement Colony			Total		
	No.	Percent	Average Income (Rs.)	No.	Percent	Average Income (Rs.)	No.	Percent	Average Income (Rs.)	No.	Percent	Average income (Rs.)
I. DELHI												
Daily Wage	28	22.8	641	8	5.6	681	20	14.9	710	56	14.0	671
Self Employment	66	53.7	817	43	30.1	1003	52	38.8	876	161	40.2	886
Regular Employment	25	20.3	754	86	60.1	1299	61	45.5	1232	172	43.0	1196
Agriculture	1	0.8	500	-	-	-	-	-	-	1	0.3	500
Others	3	2.4	533	6	4.2	1417	1	0.8	900	10	2.5	1100
Total	123	100.0	754	143	100.0	1180	134	100.0	1013	400	100.0	993
II. GHAZIABAD												
Daily wage	16	10.7	612	16	16.0	662	-	-	-	32	12.8	637
Self Employment	90	60.0	719	43	43.0	847	-	-	-	133	53.2	760
Regular Employment	41	27.3	939	41	41.0	1167	-	-	-	82	32.8	1053
Agriculture	-	-	-	-	-	-	-	-	-	-	-	-
Others	3	2.0	1233	-	-	-	-	-	-	3	1.2	1233
Total	150	100.0	778	100	100.0	948	-	-	-	250	100.0	846
III. HYDERABAD												
Daily Wage	114	49.2	601	42	47.2	639	31	39.2	762	187	46.7	636
Self Employment	104	44.8	609	45	50.6	564	37	46.9	787	186	46.5	633
Regular Employment	13	5.6	682	2	2.2	700	11	13.9	847	26	6.5	745
Agriculture	-	-	-	-	-	-	-	-	-	-	-	-
Others	1	0.4	950	-	-	-	-	-	-	1	0.3	950
Total	232	100.0	614	89	100.0	602	79	100.0	786	400	100.0	643
TOTAL												
Daily Wage	158	31.3	609	66	19.9	650	51	23.9	741	275	26.2	643
Self Employment	260	51.5	700	131	39.5	801	89	41.8	839	480	45.7	753
Regular Employment	79	15.6	838	129	38.8	1248	72	33.8	1174	280	26.7	1112
Agriculture	1	0.2	500	-	-	-	-	-	-	1	0.1	500
Others	7	1.4	893	6	1.8	1417	1	0.5	900	14	1.3	1118
Total	505	100.0	697	332	100.0	956	213	100.0	929	1050	100.0	824

period of more than 10 years, 41.7 per cent between 6 and 10
years and as many as 36.3 per cent between 1 and 5 years. The
Hyderabad situation is a direct consequence of the fact that
the majority of sample households have in-migrated in the last
5 to 10 years and there is indication of a definite gestation
period to arrive at some semblance of regular income-earning
activity (Table III.6).

The relatively long period of income generation by SDS
households makes it noteworthy that, irrespective of the
occupation pattern, the fact that income is derived from
informal sector activities, the households have settled into
an economic stream and their income flow has acquired a
pattern of regularity. Discussions with the households did
reveal disparities in month-to-month income flows, mainly
linked to seasonal fluctuations, but data for a 12-month period
confirm regularity in amount of income flows over the last
5 - 10 years.

The income data suggest that it is extremely dangerous
to base any assessment of economic status and affordability of
a household on a single economic or income parameter like
monthly income flow. A more appropriate insight is possible
only when a series of income data, including occupation and
source of income generation, period of income generation and
pattern of household expenditure are examined simultaneously.

d. Range of Income Flow

Table III.7 presents data on the level of lowest and
highest monthly income for the sample households in Delhi,
Ghaziabad and Hyderabad for each of their major types of
urban informal settlements. These data are also compared with
the average monthly income flows in the respective type of
the settlements in each city. The lowest monthly income among the

Table - III.6 : Income Period of SDS Sample Head of Households

Income period (Year)	JJC			UAC			RSC			TOTAL		
	No.	Per cent	Average Income (Rs.)	No.	Per cent	Average Income (Rs)	No.	Per cent	Average Income (Rs)	No.	Per cent	Average Income (Rs)
I. DELHI												
Less than 1	3	2.4	617	2	1.4	1150	–	–	–	5	1.3	830
1-5	10	8.1	665	11	7.7	991	8	6.0	1000	29	7.3	881
6-10	25	20.3	674	28	19.6	1021	22	16.4	1048	75	18.7	913
More than 10	85	69.2	796	102	71.3	1245	104	77.6	1007	291	72.2	1030
Total	123	100.0	754	143	100.0	1180	134	100.0	1013	400	100.0	993
II. GHAZIABAD												
Less than 1	2	1.3	550	4	4.0	700	–	–	–	6	2.4	650
1 - 5	27	18.0	724	21	21.0	910	–	–	–	48	19.2	805
6 - 10	40	26.7	807	22	22.0	995	–	–	–	62	24.8	861
More than 10	81	54.0	787	53	53.0	978	–	–	–	134	53.6	863
Total	150	100.0	778	100	100.0	948	–	–	–	250	100.0	846
III HYDERABAD												
Less than 1	–	–	–	–	–	–	–	–	–	–	–	–
1 - 5	65	28.0	672	45	50.6	627	35	44.3	771	145	36.3	682
6 - 10	91	39.2	592	40	44.9	583	36	45.6	811	167	41.7	635
More than 10	76	32.8	581	4	4.5	525	8	10.1	862	88	22.0	604
Total	232	100.0	614	89	100.0	602	79	100.0	786	400	100.0	643
TOTAL												
Less than 1	5	1.0	590	6	1.8	850	–	–	–	11	1.0	732
1 - 5	102	20.2	685	77	23.2	756	43	20.2	814	222	21.1	735
6 - 10	156	30.9	661	90	27.1	820	58	27.2	901	304	29.0	750
More than 10	242	47.9	726	159	47.9	1138	112	52.6	996	513	48.9	913
Total	505	100.0	697	332	100.0	956	213	100.0	929	1050	100.0	824

NOTE: JJC - Jhuggi Jhopri Cluster,   UAC - Unauthorised Colony
      RSC - Resettlement Colony

1050 SDS households is Rs.200 and the highest monthly income
is 12.5 times higher at Rs.2,500 p.m.   While the lowest income
is in the JJC, the highest income is in the RSC and UAC.   It
is interesting to note that both the lowest and highest incomes
are in Delhi.

Table   III.7   Highest, Lowest and Average Monthly
Income of SDS Sample Households, 1990

	Highest	Lowest	Average	Percent	Variation between	
	(1)	(2)	(3)	1 & 2	1 & 3	2 & 3
1. Delhi						
JJC	1800	200	754	800.0	139.0	277.0
UAC	2500	500	1180	400.0	112.0	136.0
RSC	2500	400	1013	525.0	147.0	153.0
2. Ghaziabad						
JJC	1600	220	778	627.0	106.0	254.0
UAC	2100	400	948	425.0	121.0	137.0
RSC	-	-	-	-	-	-
3. Hyderabad						
JJC	1250	350	676	257.0	85.0	93.0
UAC	1000	300	607	233.0	65.0	102.0
RSC	1000	200	786	400.0	27.0	75.0

Note :JJC - Jhuggi Jhopri Cluster
      UAC - Unauthorised Colony
      RSC --Resettlement Colony

e.   Income Trends

The trends in average monthly income for the four-year
period 1987 to 1990, presented in Table III.8, suggest a

clear improvement in the economic status of the SDS households, though some variation in the level of improvement is seen between cities and within each city in the different types of settlements. At the SDS sample level, the average monthly income of the households has gone up from Rs.717 in 1987 to Rs.792 in 1988, Rs.883 in 1989 and Rs.947 in 1990.(Chart A)

There is no noticeable variation in the rate of improvement in the economic status of households in Hyderabad, Ghaziabad and Delhi as measured by improvement in income in money terms between 1987 and 1990. At the overall level for the three cities taken together, the increase is 32.1 per cent, and at the city level, the increase is 32.0 per cent in Delhi, 33.3 per cent in Ghaziabad and 33.5 per cent in Hyderabad.

There is, however, a marked variation in the relative improvement in the economic status in the different types of urban informal settlements. Thus, for example, for the SDS sample as a whole, the average monthly income during 1987-90 has improved by 35.4 per cent for JJC households, 33.3 per cent for UAC households and only 25.7 per cent for RSC households. The low level of improvement in the case of RSC households is seen in both cities that have RSC - Hyderabad (28.0 per cent increase) and in Delhi (24.6 per cent increase).

f. Income Group Distribution

The SDS sample households have been distributed into five income groups based on average monthly income in 1990 of the head of household who was also the respondent in the SDS survey. These groups are :

    i.   Upto Rs.500
   ii.   Rs.501-Rs.1,000
  iii.   Rs.1,001-Rs.1,500
   iv.   Rs.1,501-Rs.2,000
    v.   Rs.2,000-plus

TRENDS IN MONTHLY INCOME
(Rs Per Month)
TOTAL

CHART -A

Legend: DELHI, GHAZIABAD, HYDERABAD, TOTAL
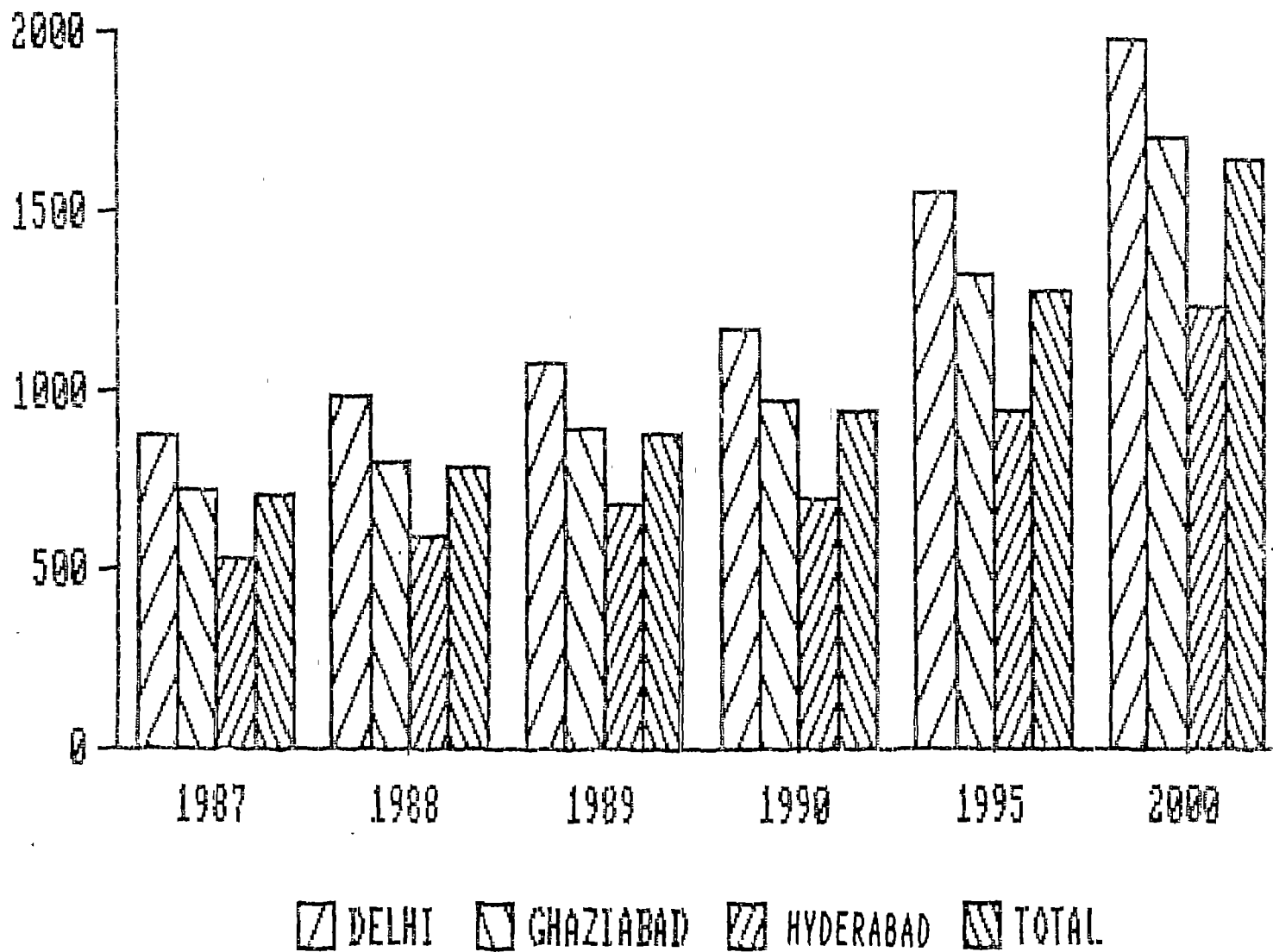
Table III.8 : Trends in Monthly Income of SDS Sample Households

		1987		1988		1989		1990	
		No.	Av. Amount (Rs.per month)	No.	Av. Amount (Rs.per month)	No.	Av. Amount (Rs.per month)	No.	Av. Amount (Rs.per month)
1.	Delhi								
	JJC	123	647	123	754	123	754	123	937
	UAC	143	1054	143	1165	143	1278	143	1384
	RSC	134	918	134	997	134	1072	134	1144
	Total	400	883	400	982	400	1073	400	1166
2.	Ghaziabad								
	JJC	150	689	150	762	150	841	150	906
	UAC	100	805	100	878	100	988	100	1091
	RSC	-	-	-	-	-	-	-	-
	Total.	250	735	250	808	250	900	250	980
3.	Hyderabad								
	JJC	200	528	231	587	231	672	232	713
	UAC	89	451	89	520	89	607	89	612
	RSC	79	615	79	692	79	796	79	787
	Total	368	528	399	592	399	682	400	705
4.	TOTAL								
	JJC	473	610	504	679	504	742	505	826
	UAC	332	817	332	905	332	1010	332	1089
	RSC	213	805	213	883	213	969	213	1012
	Total	1018	717	1049	792	1049	883	1050	947

Note : JJC : Jhuggi Jhopri Cluster

UAC : Unauthorised Colony

RSC : Resettlement Colony

Table III.9 presents the distribution of the sample house-
holds in each of the income groups in the sample towns for
their three categories of urban informal settlements. In each
case the average monthly income for the respective group is
also presented.

The analysis of the income distribution of the SDS house-
holds indicates that more than two-third of them are in the
income range Rs.501-Rs.1,000, and another 12.0 per cent in
the income range Rs.1,001-Rs.1,500. In other words, more than
80.0 per cent of the SDS households have a monthly income
ranging from Rs.501 to Rs.1,500. This is the approximate pro-
portion for UAC and RSC households but in the case of JJC
households, the proportion is slightly lower at 77.4 per cent.

4.   Household Budget

a. Relevance of Budget Analysis

An exclusive analysis of income data does not seem to be
adequate input for formulating pricing policies for urban
services on the principle of the assessed affordability of
target group, particularly in the case of low-income house-
holds. An equally important input is the analysis of
composition of the household budget and, in particular, of the
factors that determine the quantum of income that is used to
meet specific household necessities like food, shelter, clothing,
water, etc. Several SDS studies on the pattern of household
expenditure of people working and living in informal settle-
ments have pointed to not only unanimously high proportion of
monthly income being used to finance the basic needs of food,
clothing, transport and medical treatment, but have also
revealed that the major reason for high per unit cost of food
(on meal-to-meal basis), for example, is the non-availability
of facilities and/or non-feasibility of the informal households

Table III.9 : Distribution of SDS Sample Respondents by Income Groups and Average income in each Income Group

		Upto 500			501-1000		Income Group (Rs) 1001-1500			1501-2000			2000 Plus			Total		
		No.	Percent	Av. Income	No.	percent	Av. Income	No.	Percent	Av. Income	No.	Per-cent	Av. Income	No.	Percent	Av. Income	No.	Per-cent	Av. Income
1.	Delhi																		
	1	20	16.3	440	86	69.9	732	16	13.0	1203	21	0.8	1800	-	-	-	123	100.0	754
	2	2	1.4	500	66	46.2	838	47	32.9	1312	25	17.5	1748	3	2.0	2367	143	100.0	1180
	3	5	3.7	472	84	62.7	801	28	20.9	1277	16	11.9	1742	1	0.7	2500	134	100.0	1013
	Total	27	6.8	450	236	59.0	786	91	22.7	1282	42	10.5	1747	4	1.0	2400	400	100.0	993
2.	Ghaziabad																		
	1	16	10.7	457	119	79.3	761	13	8.7	1200	2	1.3	1600	-	-	-	150	100.0	778
	2	7	7.0	485	64	64.0	801	22	22.0	1268	6	6.0	1700	1	1.0	2100	100	100.0	948
	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	23	9.2	466	183	73.2	775	35	14.0	1243	8	3.2	1675	1	0.4	2100	250	100.0	846
3.	Hyderabad																		
	1	75	32.3	440	157	67.7	693	-	-	-	-	-	-	-	-	-	232	100.0	614
	2	23	25.8	400	66	74.2	673	-	-	-	-	-	-	-	-	-	89	100.0	602
	3	-	-	-	79	100.0	786	-	-	-	-	-	-	-	-	-	79	100.0	786
	Total	98	24.5	431	302	75.5	714	-	-	-	-	-	-	-	-	-	400	100.0	645
4.	TOTAL																		
	1	111	22.0	442	362	71.7	725	29	5.7	1202	3	0.6	1667	-	-	-	505	100.0	697
	2	32	9.6	425	196	59.0	770	69	20.8	1298	31	9.3	1739	4	1.3	2300	332	100.0	955
	3	5	2.3	472	163	76.6	794	28	13.1	1277	16	7.5	1742	1	0.5	2100	213	100.0	929
	Total	148	14.1	439	721	68.7	753	126	12.0	1271	50	4.8	1735	5	0.4	2260	1050	100.0	826

NOTE: 1. Jhuggi Jhopri Cluster, 2. Unauthorised Colony . 3 Resettlement Colony

-43-

to utilise the facilities of subsidised food rations that are
normally available to formal sector households. These SDS
studies have suggested that proper food delivery system,
structured on the ration-absorbing capacity of the target-
group, is likely to lead to a saving on the food consumption
basket as proportion of the total household budget by 25.0 to
35.0 per cent.

b. Composition and Structure of Household Budget

The SDS data on the budget of households in urban informal
settlements is, thus, very relevant for measuring their capacity
to pay for water. These data show that food is the major
expenditure item in the household budget, accounting for almost
two-third of the average monthly income. The proportion is
higher for the lowest income group, having an average monthly
income of upto Rs.500, this group covering 77.8 per cent of the
SDS households budget. The proportion is progressively reduced
with increase in the level of income. Thus, food accounts for
50.3 per cent of the total budget in the income group of
Rs.2,000 plus. The city level data present a similar picture,
that food is a major budget item of all respondents, though
the proportion of household budget going to this item varies
from 55.2 per cent in Delhi to 57.8 per cent in Hyderabad and
70.4 per cent in Ghaziabad. For the income group upto Rs.500,
food accounts for almost the entire household budget in
Ghaziabad (Table III.10 and Chart - B)

Some data were obtained on the expenditure incurred by SDS
households on water. About two-fifth of the SDS households pay
some amount for their water consumption, the average amount
working out to Rs.11 per month and ranging from a low of Rs.7 in
the JJC of Ghaziabad to a high of Rs.20 in the JJC of Hyderabad.
Water accounts for, on the average, 0.6 per cent of the house-
hold budget of those who incur some expenditure on this account.

Table III.10 : Composition and Structure of Household Budget

	Food		Water		Clothing		Education	
	No.	Average Amount	No.	Average Amount	No.	Average Amount	No.	Average Amount
1. Delhi								
JJC	123 (100.0)	560 (71.0)	42 (34.1)	12 (0.5)	108 (87.8)	64 (7.1)	44 (35.8)	53 (1.8)
UAC	143 (100.0)	746 (63.5)	138 (96.5)	14 (1.0)	139 (97.2)	95 (7.9)	115 (80.4)	100 (6.9)
RSC	134 (100.0)	684 (48.1)	134 (100.0)	11 (1.1)	123 (91.8)	81 (7.4)	87 (64.9)	79 (5.2)
Total	400 (100.0)	668 (66.8)	314 (78.5)	12 (0.9)	370 (92.5)	81 (7.5)	246 (61.5)	82 (5.0)
2. Ghaziabad								
JJC	150 (100.0)	571 (70.3)	43 (28.7)	7 (0.2)	133 (88.7)	69 (7.5)	47 (31.3)	42 (1.6)
UAC	100 (100.0)	623 (66.6)	74 (74.0)	13 (1.0)	98 (98.0)	80 (8.5)	81 (81.0)	61 (5.3)
RSC	–	–	–	–	–	–	–	–
Total	250 (100.0)	592 (68.7)	117 (46.8)	10 (0.6)	231 (92.4)	74 (7.9)	128 (51.2)	54 (3.2)
3. Hyderabad								
JJC	232 (100.0)	396 (62.1)	2 (0.9)	20 (N)	178 (76.7)	44 (5.3)	24 (10.3)	37 (0.6)
UAC	89 (100.0)	316 (54.7)	–	–	66 (74.1)	33 (4.3)	7 (7.9)	31 (0.4)
RSC	79 (100.0)	408 (55.8)	–	–	71 (89.9)	39 (4.9)	15 (19.0)	41 (1.0)
Total	400 (100.0)	380 (59.2)	2 (0.4)	20 (N)	315 (78.8)	41 (5.0)	46 (11.5)	37 (0.7)
TOTAL								
JJC	505 (100.0)	488 (67.2)	87 (17.2)	9 (0.2)	419 (83.0)	57 (6.5)	115 (22.8)	45 (1.3)
UAC	332 (100.0)	594 (63.0)	212 (63.8)	13 (0.8)	303 (91.3)	77 (7.5)	203 (61.1)	82 (5.3)
RSC	213 (100.0)	582 (64.4)	134 (62.9)	11 (0.7)	194 (91.1)	66 (6.6)	102 (47.9)	73 (3.9)
Total	1050 (100.0)	540 (65.1)	433 (41.2)	11 (0.6)	916 (87.2)	65 (6.9)	420 (40.0)	70 (3.3)

	Rental		Transport		Entertainment		Medical	
	No.	Average Amount	No.	Average Amount	No.	Average Amount	No.	Average Amount
1. Delhi								
JJC	2 (1.6)	35 (0.1)	36 (29.3)	41 (1.6)	18 (14.6)	46 (0.8)	90 (73.2)	34 (3.2)
UAC	4 (2.8)	139 (0.3)	92 (64.3)	60 (3.3)	62 (43.3)	68 (2.5)	102 (71.3)	54 (3.2)
RSC	1 (0.7)	100 (0.1)	55 (41.0)	53 (2.2)	30 (22.4)	59 (1.3)	94 (70.1)	43 (2.9)
Total	7 (1.8)	104 (0.2)	183 (45.8)	541 (2.5)	110 (27.5)	62 (1.7)	286 (71.5)	44 (3.1)
2. Ghaziabad								
JJC	19 (12.7)	55 (0.9)	75 (59.0)	31 (1.9)	54 (36.0)	35 (1.5)	112 (76.7)	36 (3.3)
UAC	1 (1.0)	50 (0.2)	77 (77.0)	40 (3.3)	29 (29.0)	43 (1.3)	92 (92.0)	37 (3.4)
RSC	–	–	–	–	–	–	–	–
Total	20 (8.0)	55 (0.5)	152 (60.8)	36 (2.5)	83 (33.2)	39 (1.4)	204 (81.6)	36 (3.5)
3. Hyderabad								
JJC	201 (86.6)	44 (6.0)	123 (53.0)	34 (2.8)	39 (16.8)	36 (0.9)	166 (71.6)	54 (6.1)
UAC	85 (95.5)	42 (7.0)	63 (70.8)	25 (3.1)	1 (1.1)	30 (0.1)	85 (95.5)	87 (13.0)
RSC	79 (100.0)	48 (6.6)	67 (84.8)	32 (4.2)	– (	–	77 (97.5)	69 (9.2)
Total	365 (91.3)	45 (6.3)	253 (63.2)	32 (3.2)	40 (10.0)	35 (0.6)	328 (82.0)	64 (8.2)
TOTAL								
JJC	222 (44.0)	45 (2.7)	234 (46.3)	34 (2.2)	111 (10.6)	37 (1.1)	368 (72.9)	44 (4.4)
UAC	90 (27.1)	46 (1.3)	232 (69.9)	44 (3.3)	92 (27.7)	60 (1.7)	279 (80.0)	56 (5.0)
RSC	80 (37.6)	49 (2.0)	122 (57.3)	44 (2.8)	30 (14.1)	59 (0.9)	171 (80.3)	55 (4.8)
Total	392 (37.3)	46 (2.1)	588 (56.0)	40 (2.7)	233 (22.2)	49 (1.3)	818 (77.9)	50 (4.7)

	Power/Fuel		Loan Repayment		Garbage Clearance		Others		TOTAL	
	No.	Average Amount	No.	Average Amount	No.	Average Amount	No.	Average Amount	No.	Average Amount
1. Delhi										
JJC	118	41	5	60	18	5	97	86	123	794
	(95.9)	(4.9)	(4.0)	(0.3)	(14.6)	(0.1)	(78.9)	(8.6)		(100.0)
UAC	140	60	7	94	96	8	102	91	143	1175
	(97.9)	(5.0)	(4.9)	(0.4)	(67.1)	(0.5)	(71.3)	(5.5)		(100.0)
RSC	130	52	7	67	56	6	100	85	134	1006
	(97.0)	(4.9)	(5.2)	(0.3)	(41.8)	(0.2)	(74.6)	(6.3)		(100.0)
Total	388	51	19	75	170	7	299	86	400	1000
	(97.8)	(5.0)	(4.7)	(0.4)	(42.5)	(0.3)	(74.8)	(6.5)		(100.0)
2. Ghaziabad										
JJC	146	36	30	61	29	8	131	62	150	924
	(97.3)	(4.3)	(20.0)	(1.5)	(19.3)	(0.2)	(87.3)	(6.6)		(100.0)
UAC	97	34	17	63	59	8	80	62	100	936
	(97.0)	(3.6)	(17.0)	(1.0)	(59.0)	(0.5)	(80.0)	(5.4)		(100.0)
RSC	–	–	–	–	–	–	–	–	–	–
Total	243	35	47	62	88	8	211	62	250	929
	(97.2)	(2.6)	(18.8)	(1.3)	(35.2)	(0.3)	(84.4)	(6.0)		(100.0)
3. Hyderabad										
JJC	223	41	44	45	–	–	185	69	232	637
	(96.1)	(6.3)	(19.0)	(1.3)			(79.7)	(8.6)		(100.0)
UAC	84	39	1	100	–	–	70	80	89	577
	(94.4)	(6.4)	(1.1)	(0.2)			(78.7)	(10.9)		(100.0)
RSC	77	46	2	100	–	–	76	91	79	730
	(97.5)	(6.1)	(2.5)	(0.3)			(96.2)	(12.0)		(100.0)
Total	384	41	47	49	–	–	331	76	400	642
	(96.0)	(6.2)	(6.7)	(0.9)			(82.8)	(9.8)		(100.0)
TOTAL										
JJC	487	40	79	52	47	7	413	71	505	760
	(96.4)	(5.2)	(15.6)	(1.2)	(9.3)	(0.1)	(81.8)	(7.9)		(100.0)
UAC	321	47	25	73	155	8	252	79	332	943
	(96.7)	(4.8)	(7.5)	(0.6)	(46.7)	(0.4)	(75.9)	(6.3)		(100.0)
RSC	207	48	9	74	56	6	176	88	213	904
	(97.2)	(5.3)	(4.2)	(0.3)	(26.3)	(0.2)	(82.6)	(8.1)		(100.0)
Total	1015	44	113	54	258	7	841	77	1050	847
	(96.7)	(5.0)	(10.8)	(0.7)	(24.6)	(0.2)	(80.1)	(7.4)		(100.0)

Note : 1. AA : Average amount in Rs. per month.

2.   : Figures in parentheses under "No." are percent of households incurring the specific expenditure to total sample households.

3.   : Figures in parentheses under "AA" are percent of total household expenditure for the respective category of settlement.

JJC :Jhuggi Jhopri Cluster   UAC :Unauthorised Colony

RSC :Resettlement Colony

STRUCTURE OF HOUSEHOLD BUDGET
TOTAL

WATER (0.6%)

OTHERS (21.7%)

GARBAGE CLEARENCE (0.2)
FUEL (5.0%)

MEDICAL (4.7%)

FOOD (65.1%)

TRANSPORT (2.7%)

47- A
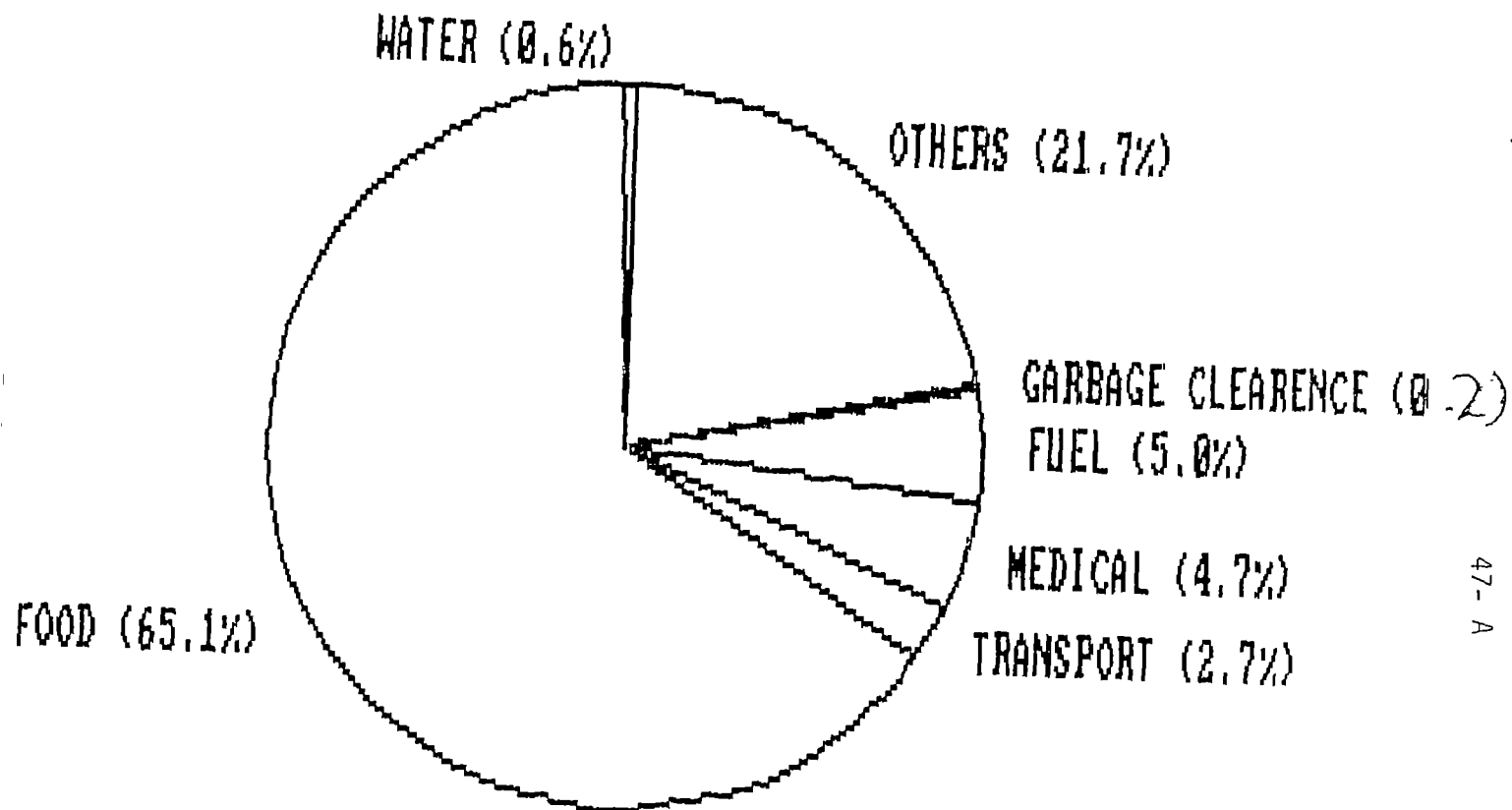
Some of the relatively high expenditure items, in terms of the proportion to total household budget, are medical treatment (4.7 per cent), power and fuel (5.0 per cent), transport (2.7 per cent), housing (2.1 per cent) and education (3.3 per cent). SDS feels that a more appropriate public intervention programme can contribute significantly to some additional savings from the present level of expenditure on these items. Appropriate public civil supply delivery system can make a substantial impact on the saving from the existing food budget and a more appropriate health care delivery system can generate savings on medical treatment account. It is relevant that extent of availability of safe water is linked with standards of health of household members in respect of improved sanitation, cleanliness, etc. leading, understandably, to reduced incidence of disease and illness and thus less expenditure on medical care. These interventions are likely to make a discernible impact on the affordability of the households to pay for public services like potable water.

5. Projected Income Profile

A very high proportion of the SDS households (98.7 per cent) provided some estimates on their projected income for two future points of time, namely, 1995 and 2000 AD. It is projected that the average income in money terms is likely to increase, as per the perception of the target households, from Rs.947 in 1990 to Rs.1,271 in 1995 (an increase of 34.2 per cent) and further to Rs.1,636 in 2000 AD or an increase of 72.8 per cent over the period 1990 to 2000 AD or 7.3 per cent per annum. Table III.10 presents the projected income data for the SDS households in Delhi, Ghaziabad and Hyderabad for each of their three categories of urban informal settlements (See also Chart-A).

Table III.11 : Projected Monthly Income of SDS Sample Households

		1990		1995		2000	
		No.	Av .Amount (Rs.)	No.	Av . Amount (Rs.)	No.	Av . Amount (Rs.)
1.	Delhi						
	JJC	123	937	123	1367	123	1876
	UAC	143	1384	143	1793	143	2203
	RSC	134	1144	134	1481	134	1846
	Total	400	1166	400	1557	400	1983
2.	Ghaziabad						
	JJC	150	906	150	1244	150	1598
	UAC	100	1091	100	1454	100	1860
	RSC	-	-	-	-	-	-
	Total	250	980	250	1328	250	1703
3.	Hyderabad						
	JJC	232	713	221	962	218	1297
	UAC	89	612	89	850	89	1108
	RSC	79	787	79	978	79	1197
	Total		705	389	940	386	1233
4.	TOTAL						
	JJC	505	826	494	1148	491	1534
	UAC	332	1089	332	1438	332	1806
	RSC	213	1012	213	1294	213	1605
	Total	1050	947	1039	1271	1036	1636

Note : JJC - Jhuggi Jhopri Cluster

UAC - Unauthorised Colony

RSC - Resettlement Colony

IV. WATER CONSUMPTION, DELIVERY SYSTEM AND AFFORDABILITY OF HOUSEHOLDS IN SLUM SETTLEMENTS.

1. Introduction

An important objective of this study is to assess the pattern of water consumption in the SDS sample households and micro enterprises so as to obtain some inputs for formulating policies and programmes to ensure adequate water supply to the poorer segments of the society as well as initiate gradual elimination of subsidy in the pricing policy. While some data are available in official documents on the total water supply in a city including the informal sector, one does not have an idea of the aggregate supply from all possible sources as supply from some of these sources are not,and cannot be,metered. No serious efforts seem to have been made by official agencies to monitor their flows. This deficiency is of particular significance in urban informal settlements.

An analysis of the composition of water consumption is another issue that has not received adequate attention in policies and programmes, particularly relating to the informal settlements. This input is critical for planning a long-term water supply strategy because different types of water (treated or nontreated) can be supplied for specific end-uses. These are some of the issues on which primary data were generated by the SDS from 1050 households & 200 economic units in Delhi, Ghaziabad and Hyderabad. On many issues the data presented in this study are the first of their kind.

2. Water Consumption Estimates

a. Methodology

The SDS field staff closely interacted with the sample respondents to estimate the average daily water consumption for various purposes. Initially the respondents found it difficult to indicate their water consumption and its pattern, because they had no idea

how to measure their consumption, nor had they even contemplated
the need to do so. On the basis of discussions with them, the SDS
survey team has estimated the water consumption behaviour using a
variety of practical methods. Thus, for example, the per capita
drinking water consumption is estimated on the basis of number of
pots or buckets in which the drinking water is collected and
stored and their normal capacity. Drinking water consumption
was also estimated on the basis of number of glasses or 'lotas' of
water normally consumed during the day. In the majority of cases,
it was measured in terms of 'lota' (made of brass) which normally
has a capacity of 1 to 1.5 litres. However, the process of drinking
leads to a lot of wastage. Water is mostly drunk by using one hand
and the other hand is used to hold the lota. SDS estimated that
25.0 per cent to 30.0 per cent of the lota water is wasted; however,
the estimates presented in this Report are gross of the wastage and
indicate the potential saving in water through appropriate education
and promotion of water conservation programmes.

A practical method was similarly used to estimate water
consumption for other purposes, such as cooking, washing, clearing
and sanitation. For these purposes, water is generally collected
and stored in buckets (plastic and metal, usually tin or wrought
iron), having storage capacity of 20 to 50 litres. The size of the
bucket was estimated by visual observation and data were generated
on the actual number of buckets used for various purposes in a day.
In Hyderabad, a 'kalash' or traditional medium sized squat-necked
metallic (brass or stainless steel) pitcher is generally used for
storing drinking water even by the poorest inspite of its high cost
(lowest price being Rs.100). It is interesting to note that inade-
quate number of taps as well as poor frequency of water supply.forces
the urban poor to invest in more than one kalash, with a maximum
storing capacity of 20 litres, for storing water. During the discu-
ssion, the respondents pointed out that an improved water supply
system, with regular supply, can reduce the financial burden of
acquiring and maintaining kalash.

b. Estimates

The total water consumption of the 1050 sample households
aggregates to 1.43 lakh litres per day(LPD).The annual consumption is
thus, estimated at 522 lakh litres. A SDS sample household of 5
members consumes 49,896 litres of water per annum and 136.7 LPD. The
per capita consumption of water is 27.3 LPD,which is considerably
below the 40 LPD per capita criterion fixed by the National Drinking
Water Mission. Further, while the Mission criteria relate to "safe"
drinking water, the SDS estimate includes water which may not nece-
ssarily qualify for inclusion in the Mission's terminology of "safe"
water (Table IV.I).

The SDS estimate of per capita water consumption in urban
slum settlements (27.3 LPD) suggests that the recent estimates of
the NCU on water consumption in urban India is on the high side.
The NCU assumes per capita consumption in class I cities, including
metropolitan cities, at 145 LPD and that in small towns (with no
public water supply or a very rudimentary supply system) at 100
LPD (NCU Report, P.699). Accordingly, the NCU has estimated total
urban water consumption for an estimated population of 20 crore
in 1988 at 9,500 million cubic metres (6500 mn.cu.m. for class I
cities and 3000 mn.cu.m. for other urban areas) and water needs
for 2001 are projected at 16,000 mn.cu.m. for an urban population
estimated to be 70 percent higher than in 1988. While the SDS
would very much support the need to develop a water management policy
on the basis of the estimated per capita LPD by NCU, which is two
to three times higher than the criterion recommended by the National
Drinking Water Mission, it strongly feels that overestimation of the
problem has the inherent danger of magnifying the investment needs,
which might not necessarily be desirable in a country where financial
resources are the major constraint to developmental programmes. It
is necessary to work out more realistic water needs and investment
scenarios.

c. Town-wise Analysis

There is significant variation in the average consumption
of water in the three cities of Delhi, Ghaziabad and Hyderabad. The

average daily water consumption per household ranges from 100
LPD in Hyderabad to 137 LPD in Ghaziabad and 173 LPD in Delhi.
There is thus a marked variation between cities and this is mainly
due to the differences in the sources of supply of water. In sur-
vey cities like Delhi, tube well and hand pump are more common
sources of water, available on a 24-hours basis, whereas the water
supply through taps and tankers is restricted to certain hours of
the day.

d. Type of Settlement

The type of settlement has a critical impact on water consum-
ption. Among the three categories of settlements covered in the
study, the most irregular settlement in the form of JJC has the
lowest consumption of water at the household level and, as the
quality of the settlement improves, there is a noticeable increase
in water consumption. Thus, while JJC households average consum-
ption of 116 LPD, the UAC average 147 LPD and the RSC 169 LPD. This
is the pattern in Delhi and Ghaziabad but in the case of Hyderabad
the trend is distinctly reversed :RSC household water consumption
on the average is 88 LPD, UAC household 91 LPD and JJC household
108 LPD.

3. Composition of Water Consumption

SDS generated data for water consumption by six major uses,
namely, drinking, cooking, washing (including utensil and clothing),
sanitation, gardening and commercial. All other uses have been
clubbed together under the broad head of 'others'. The category
of 'other' uses includes water for water coolers, washing of
cycles and scooters, etc. TableIV.1 presents data on the pattern
of water consumption by major end-use and Table IV.2 and Chart-C
on its structural composition.

Direct household needs like drinking, cooking and washing
account for more than four-fifth of the water consumption in the
SDS households. The proportion of water consumption for these
three basic needs goes down progressively with improvement in the

Table IV.1: Daily Water Consumption in SDS Sample Households

(Litres per day)

| | Delhi | | | | | | | | Ghaziabad | | | | | | | |
| | JJC | | UAC | | RSC | | Total | | JJC | | UAC | | RSC | | Total | |
	Total	AA HH	Total	AA HH	Total	AA HH	Total	AA HH	Total	AA HH	Total	AA HH	Total	AA HH	Total	AA HH
1. Drinking	2257	18.3	3103	21.7	2655	19.8	8015	20.0	3000	20	2088	20.8	--	–	5088	20.
2. Cooking	4362	35.4	7620	53.3	8790	65.6	20772	51.9	5900	39	4152	41.5	--	–	10052	40.
3. Washing	5205	42.3	9035	63.2	9617	71.8	23857	59.6	8270	55	6210	62.0	--	–	14480	57.
4. Sanitation	1428	11.5	3620	25.3	4335	32.4	9383	23.4	1581	10	1280	12.8	--	–	2861	11.
5. Gardening	–	–	647	4.5	70	0.5	717	1.8	20	N	125	1.2	--	–	145	0.
6. Commercial	–	–	–	–	65	0.4	65	0.2	–	–	–	–	–	–	–	–
7. Others	766	6.2	2175	15.2	3431	25.5	6372	15.9	770	5	790	7.9	–	–	1560	6.
TOTAL	14018	114	26200	183	28963	216	69181	173	19541	130	14645	146	–	–	34186	136.

| | Hyderabad | | | | | | | | Total | | | | | | | |
| | JJC | | UAC | | RSC | | Total | | JJC | | UAC | | RSC | | Total | |
	Total	AA HH	Total	AA HH	Total	AA HH	Total	AA HH	Total	AA HH	Total	AA HH	Total	AA HH	Total	AA HH
1. Drinking	3694	15.9	1454	16.3	1361	17.2	6509	16.3	8951	17.7	6645	20.0	4016	18.8	19612	18.?
2. Cooking	6380	27.0	2173	24.4	1901	24.1	10454	26.0	16642	32.3	13945	42.0	10691	50.1	41278	39.
3. Washing	11352	48.9	3243	36.4	2644	33.5	17239	43.0	24827	49.2	18488	55.7	12261	57.5	55576	53.0
4. Sanitation	3413	14.7	1265	14.2	1035	13.1	5713	14.3	6422	12.7	6165	13.6	5370	25.2	17957	17.
5. Gardening	25	N	–	–	–	–	25	N	45	N	772	2.3	70	0.3	887	0.
6. Commercial	70	N	–	–	–	–	70	N	70	–	–	–	65	0.3	135	0.
7. Others	30	N	–	–	–	–	30	N	1566	3.1	2965	8.9	3431	16.1	7962	7.
TOTAL	24964	107.6	8135	91.4	6941	87.9	40040	100	58523	116	48980	147	35904	168.6	143407	136.7

NOTE:

JJC : Jhuggi Jhopri Cluster

UAC : Unauthorised Colony

RSC : Resettlement Colony

AAHH : Average Amount of Water Consumption per Household

N : Negligible

Table IV.2 <u>Structural Pattern of Water Consumption in SDS Sample Households</u>

(Percent of total)

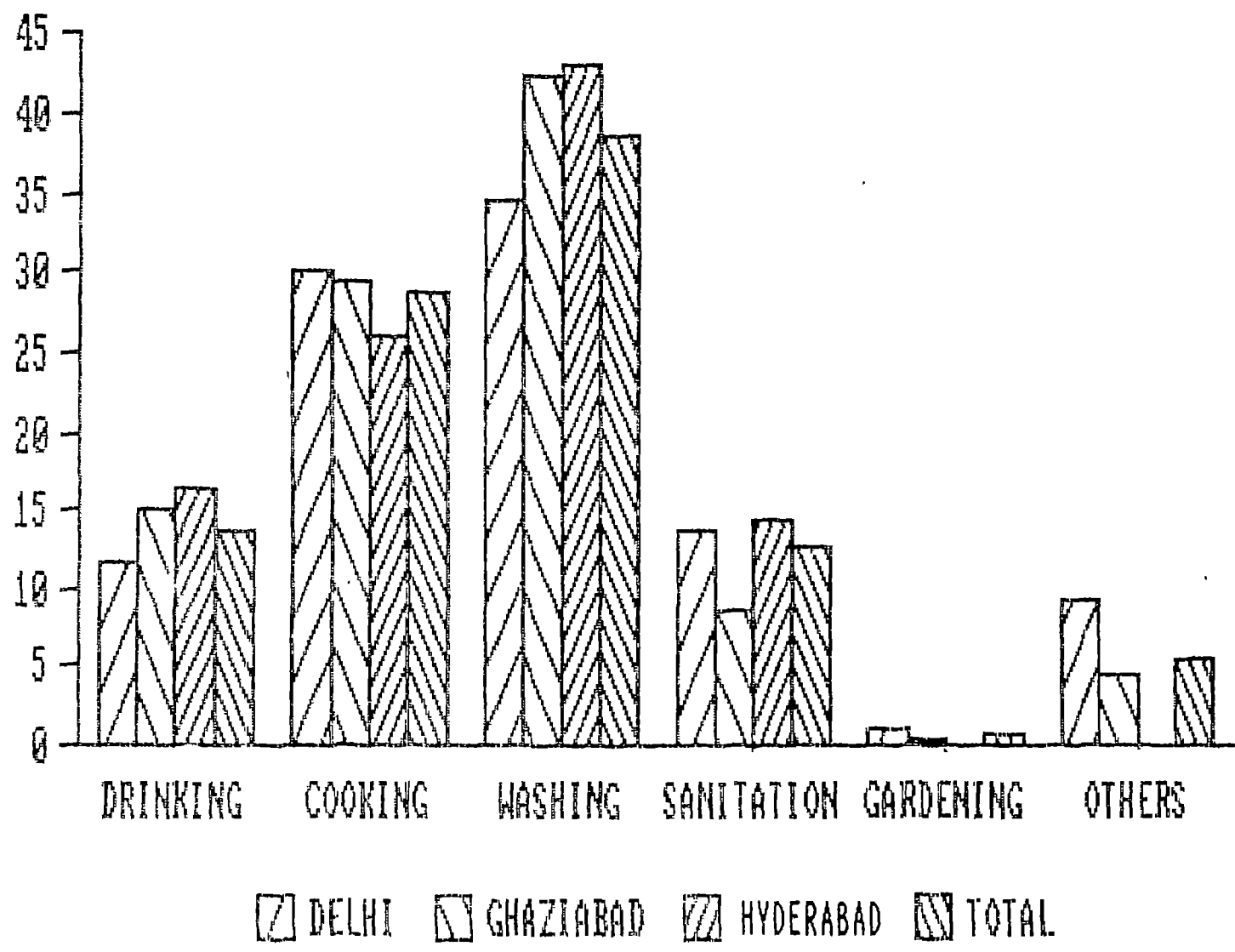|	Delhi				Ghaziabad				Hyderabad				Total			
	JJC	UAC	RSC	Total	JJC	UAC	RSC	Total	JJC	UAC	RSC	Total	JJC	UAC	RSC	Total
1. Drinking	16.1	11.8	9.2	11.6	15.4	14.3	-	14.9	14.8	17.9	19.6	16.3	15.3	13.6	11.2	13.6
2. Cooking	31.1	29.1	30.3	30.0	30.7	28.3	-	29.4	25.5	26.7	27.4	26.1	28.4	28.5	29.8	28.7
3. Washing	37.1	34.5	33.2	34.5	42.3	42.4	-	42.3	45.5	39.9	38.1	43.0	42.4	37.7	34.1	38.7
4. Sanitation	10.2	13.8	15.0	13.6	8.1	8.7	-	8.4	13.7	15.5	14.9	14.3	11.0	12.6	15.0	12.5
5. Gardening	-	2.5	0.2	1.0	0.1	0.9	-	0.4	0.1	-	-	N	0.1	1.0	0.1	0.6
6. Commercial	-	-	0.2	0.1	-	-	-	-	0.3	-		0.2	0.1	-	0.1	0.3
7. Other	5.5	8.3	11.9	9.2	3.9	5.4	-	4.6	0.1	-	-	0.1	2.7	6.0	9.7	5.5
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	-	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

NOTE   JJC : Jhuggi Jhopri Cluster

UAC : Unauthorised Colony

RSC : Resettlement Colony

CHART – C

STRUCTURAL PATTERN OF WATER CONSUMPTION
TOTAL (Percent)

DRINKING   COOKING   WASHING   SANITATION   GARDENING   OTHERS

▨ DELHI   ◩ GHAZIABAD   ▨ HYDERABAD   ◩ TOTAL

quality of habitat, also to a large extent reflecting higher
economic status and wider range of water use. Thus, for example,
86.1 percent of the water consumption of JJC households meets
these three basic needs, whereas for UAC and RSC the proportions
are 79.8 per cent and 75.1 per cent, respectively. One possible
explanation for this disparity is that most of the JJC households
do not use water for purposes like gardening and sanitation and
have relatively less need of water for washing clothes and utensils.
The proportion of water consumption on sanitation is, therefore,
only 11.0 per cent for RSC. Except for UAC households, there is
very little evidence of water being used for gardening, and in the
case of the UAC household, this end-use of water accounts for 1.6
per cent of total household water consumption. In terms of per
household consumption, gardening accounts for 2.3 LPD consumption
for UAC household as compared to 0.4 LPD for the total SDS sample.

The high proportion of water consumption to meet the three
basic needs of drinking, cooking and washing is seen uniformly in
the sample cities of Delhi, Ghaziabad and Hyderabad as well as for
the different types of settlements in each. There is, however,a
very small proportion of water consumption for sanitation in
Ghaziabad (8.4% of the total consumption)   as compared to Delhi (13.6
per cent) or Hyderabad (14.3 per cent). This is because of the
highly inadequate sanitation facilities in Ghaziabad, while Hydera-
bad has a fairly well-developed sanitation system due to special
efforts of the State Government with the support of some inter-
national agencies. In Delhi, DDA Slum Wing has made special efforts
to provide sanitation and sewerage facility through Sulabh
Shouchalaya in the informal sector in the capital city, particularly
in JJC and RSC, mainly through community-based toilets.

The per capita water consumption for major end-uses in
urban slums as revealed by the SDS estimates, brings out a scenario
which is very depressing in terms of the norms recently recommended
by the NCU as 'absolute minimum' and 'desirable' water consumption
for urban India. Table IV.3 presents the comparative NCU norms
and SDS estimates. While for cooking and drinking, the average

Table IV.3   <u>Water Consumption Norms</u>

(Litres Per Day Per Capita)

	Cooking & Drinking	Bathing & Flushing	Washing /1	Others /2	Total
I <u>SDS Estimates</u>					
JJC	9.0	2.3	8.8	0.6	20.7
UAC	11.3	3.4	10.1	2.0	26.8
RSC	12.5	4.6	10.5	3.0	30.6
Total	10.5	3.1	9.5	1.5	24.6
II <u>NCU Recommendation</u>					
a. Absolute Minimum	10.0	30.0	30.0		70.0
b. Desirable	15.0	40.0	35.0		90.0

Note : 1.   Washing of utensils & clothes

      2.   Others include gardening, filling air cooler, washing cycles, two wheelers, etc.
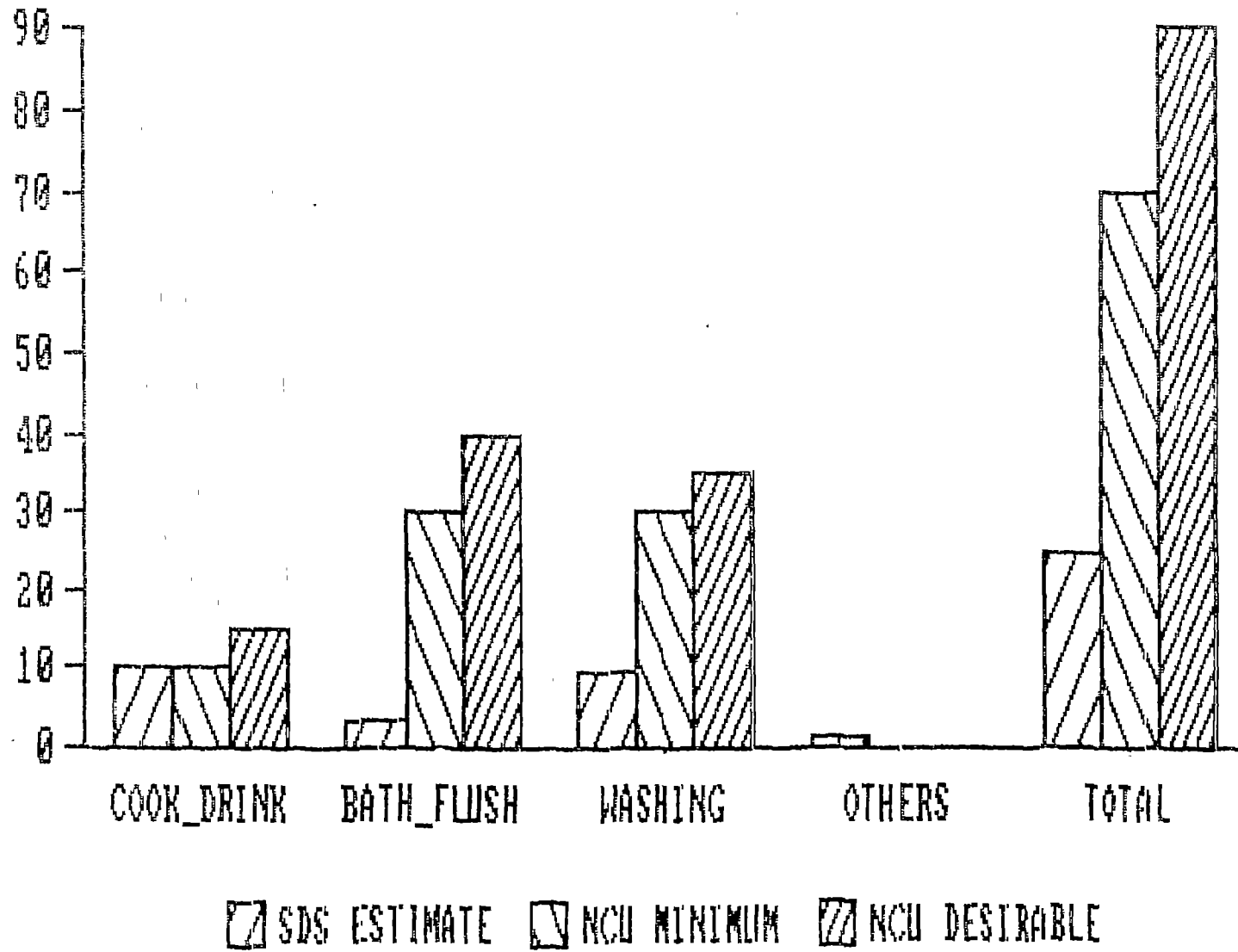
         JJC : Jhuggi Jhopri Cluster
         UAC : Unauthorised Colony
         RSC : Resettlement Colony

WATER CONSUMPTION NORMS
(LPD Per Capita)

Legend: SDS ESTIMATE NCU MINIMUM NCU DESIRABLE

consumption in urban slums, as per the SDS data, is comparable
with the absolute minimum norm recommended by the NCU (10.5 and
10.0 LPD respectively), the actual consumption still remains
only two-third of the 'desirable' norm recommended by the NCU
(15.0 LPD). There is significant disparity in terms of the actual
consumption and NCU norms for other end-uses like bathing and
washing, SDS data show per capita LPD of 3.1 for bathing and 9.5
for washing as compared to ∂ the absolute minimum norms recommen-
ded by the NCU of 30.0 LPD for each end-use. As a result, the
total water consumption norms for urban India recommended as
'absolute minimum' by the NCU is 70 LPD as compared to actual
consumption of 24.6 LPD by the SDS sample households in slum
settlements (Chart - D).

4.   Water Supply Delivery System

    a.   Sources
        There are two major sources of water supply in the informal
settlements in Delhi and Ghaziabad, namely, community tap provided
by the local development authority or municipal corporation and
hand pump within the clusters, installed by the local development
authority or corporation or by the people themselves. In Hydera-
bad, there is one more major source, namely pond, lake, well and
train compartments. Trains are a major source of supply in Hydera-
bad, particularly in some of the JJC's along the railway tracks.
Water is "taken" from the compartment when the train is stationed
at the periphery of the station. None of the sample clusters has
regular supply of water made from tanker services though occasiona-
lly water tankers do play some role.

        The predominant source of water supply in the urban infor-
mal settlement is tap water provided by the development authority
or the local body. In the JJC and RSC, these taps are installed
mainly on community basis though in some RSC there are some direct
house-level connections. Individual taps are also evident in a
large proportion of SDS sample households, in the individual cities
the proportion of such households ranges from 54.3 per cent in
Delhi to 55.2 per cent in Ghaziabad and 73.3 per cent in Hyderabad.

TableIV,4 : Major Sources of Water Supply in SDS sample clusters

	Delhi								Ghaziabad							
	JJC		UAC		RSC		Total		JJC		UAC		RSC		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
1. Source of Water																
a. Tap	84	68.3	2	1.4	131	97.8	217	54.3	105	70.0	33	33.0	–	–	138	55.2
b. Hand pump	39	31.7	141	98.6	3	2.2	183	45.7	45	30.0	67	67.0	–	–	112	44.8
c. Tube Well	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
d. Others	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
II. Location																
a. Within house	13	10.6	98	68.5	134	100.0	245	61.2	1	0.7	68	68.0	–	–	69	27.6
b. Within Cluster	110	89.4	45	31.5	–	–	155	38.8	149	99.3	32	32.0	–	–	181	72.4
c. Outside cluster	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
III. Distance																
a. Negligible	56	45.5	137	95.8	134	100.0	327	81.7	41	27.3	88	88.0	–	–	129	51.
b. < ½ km.	67	54.5	6	4.2	–	–	73	18.3	109	72.7	12	12.0	–	–	121	48.4
c. ½ – 1 km	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
d. > 1 km	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	

| | Hyderabad | | | | | | | | Total | | | | | | | |
| | JJC | | UAC | | RSC | | Total | | JJC | | UAC | | RSC | | Total | |
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
I. SOURCE OF WATER																
a. Tap	162	69.9	52	58.4	79	100.0	293	73.3	351	69.5	87	26.2	210	98.6	648	61.7
b. Handpump	20	8.6	16	18.0	-	-	36	9.0	104	20.6	224	67.5	3	1.4	331	31.5
c. Tube Well	1	0.4	-	-	-	-	1	0.2	1	0.1	-	-	-	-	1	0.1
d. Others 1/	49	21.1	21	23.6	-	-	70	17.5	49	9.8	21	6.3	-	-	70	6.7
II. LOCATION																
a. Within house	-	-	-	-	-	-	-	-	14	2.8	166	50.0	134	62.9	314	29.9
b. Within cluster	160	69.0	25	28.1	79	100.0	264	66.0	419	83.0	102	30.7	79	37.1	600	57.1
c. Outside cluster	72	31.0	64	71.9	-	-	136	34.0	72	14.2	64	19.3	-	-	136	13.0
III. Distance																
a. Negligible	142	61.2	34	38.2	41	51.9	217	54.3	239	47.3	259	78.0	175	82.2	673	64.1
b. $< \frac{1}{2}$ km.	80	34.5	40	44.9	38	48.1	158	39.5	256	50.7	58	17.5	38	17.8	352	33.5
c. $\frac{1}{2}$ - 1 km	4	1.7	5	5.6	-	-	9	2.2	4	0.8	6	1.5	-	-	9	0.9
d. > 1 km	6	2.6	10	11.3	-	-	16	4.0	6	1.2	10	3.0	-	-	16	1.5

Note: JJC : Jhuggi Jhopri Cluster   UAC: Unauthorised Colony   RSC: Resettlement Colony
1 Other sources include Pond, City Lakes and water from the compartments of trains stationed at the periphery of railway stations.

There is, however, a significant difference in the role of piped
water supply in UAC houses, where this source covers only 26.1
per cent of the sample. This low proportion is mainly due to a
poor coverage in the UAC housing stock in Delhi (1.4 per cent)
and to some extent in Ghaziabad(33.0 per cent), though the pro-
portion is quite high in Hyderabad (58.4 per cent). Hand pump
is the second important source of water supply, serving 31.5 per
cent of the sample households. In the RSC the role of hand pumps
is insignificant (covering 1.4 per cent of the housing units),
while it is most significant in the case of UAC housing stock.
(Table IV.4).

      b. Location

As the water source for the household is mainly at commu-
nity level rather than at individual level, the majority (57.1 per
cent) of the sample housing stock have a water source within the
cluster. In the case of JJC units, as many as 83.0 per cent units
are provided water by a community tap or hand pump, while in the
case of RSC and UAC units, the proportions are 30.7 per cent and
37.1 per cent, respectively. In some cases, water has to be obtai-
ned from outside the cluster and this is evident in both JJC unit
(14.2 per cent) and UAC unit (19.3 per cent).

It is, however, interesting to find that 2.8 per cent of
the JJC units have a hand pump or tap within their house and this
is almost only in Delhi, where 13 out of the 123 JJC units have
such a facility.

Direct water connection within the housing unit seems to
be a common feature of RSC units (62.9 per cent) and also clearly
noticeable in UAC units (50.0 per cent). In the RSC units in Delhi,
all the sample units have a direct water connection within the
house. But in Hyderabad none of the housing unit is in the cate-
gory of housing stock that has such a facility.

c. ~~Distance~~

As location of the water source is inside the housing unit
or within the cluster, the distance from the individual unit is
negligible in the case of 64.1 per cent of the SDS sample housing
stock and is less than half a kilometre in the case of another
33.5 per cent of the housing stock. In only 2.4 per cent of the
sample units, limited in JJC and UAC units in Hyderabad, the dista-
nce of water supply source from the respective units is more than
half a kilometre.

d. Hours of Supply

. A critical parameter to assess the availability of water in
the urban slum settlements is the hours of supply through the
various sources. While hand pump is a round-the-clock source of
water, piped water, either on a community or individual unit basis,
is restricted to a few hours in the morning and/or in the evening.
SDS·estimates that tap water in the sample informal settlements in
Delhi is available, on the average, for 6 hours, and in Ghaziabad
and Hyderabad, piped water is available for 4 hours and 3 hours,
respectively. There is some variation in the duration of water
supply through the pipe delivery system in the different types of
settlement, as can be seen from Table IV.5 .

5. Seasonal Pattern of Drinking Water Consumption

SDS has made some estimates on the drinking water consumption
pattern during different periods of the year, roughly coinciding
with the summer, winter and monsoon months, each period of roughly
4 months duration. These estimates have been made at a disaggre-
gated level for the male and female adult members of the household
and the children and are presented in Tables IV.6 & 7 and Chart - E.

SDS data suggest that per capita water consumption, as can
be expected, is directly affected by climatic variations. It is
minimum in the monsoon months and only marginally higher in the winter
months but in the summer months the consumption spurts by more than
40.0 per cent. This is the pattern in all the three sample cities
as well as in the different types of settlements.

Table IV.5. Frequency of Water Supply in Sample Clusters.

(Average hours per day)

	Delhi				Ghaziabad				Hyderabad				Total			
	JJC	UAC	RSC	Total	JJC	UAC	RSC	Total	JJC	UAC	RSC	Total	JJC	UAC	RSC	Total
1. Tap	2	4	12	6	2	6	–	4	2	2	6	3	2	4	8	5
2. Hand Pump	24	24	24	24	24	24	–	24	24	24	–	24	24	24	24	24
3. Tube well	–	–	–	–	–	–	–	–	8	–	–	8	–	–	–	–
4. Others	–	–	–	–	–	–	–	–	6	6	–	6	–	–	–	–

Note :

JJC : Jhuggi Jhopri Cluster

UAC : 'Unauthorised Colony

RSC : Resettlement Colony

- 84 -

Table IV. 6 <u>Daily Drinking Water Consumption in Summer, Winter and Monsoon by SDS Sample Households</u>

(Litres per day)

			Summer				Winter			
			Male	Female	Children	Total	Male	Female	Children	Total
I.	**DELHI**									
a)	JJC	Total	1239	936	936	3110	713	542	498	1753
		PC	8.9	6.9	2.3	4.6	5.1	4.0	1.2	2.6
b)	UAC	Total	1660	1328	1285	4273	926	723	717	2366
		PC	9.5	7.6	2.6	5.0	5.3	4.1	1.5	2.8
c)	RSC	Total	1450	1072	1135	3657	783	595	623	2001
		PC	9.6	7.2	2.4	4.7	5.2	3.9	1.3	2.6
d)	Total	Total	4348	3336	3356	11040	2422	1860	1838	6120
		PC	9.4	7.3	2.4	4.8	5.2	4.1	1.3	2.7
II.	**GHAZIABAD**									
a)	JJC	Total	1528	1190	1281	3999	885	683	720	2288
		PC	8.9	6.8	2.6	4.8	5.1	3.9	1.5	2.7
b)	UAC	Total	1059	855	917	2831	590	468	525	1583
		PC	9.5	7.6	2.8	5.1	5.3	4.2	1.6	2.9
c)	RSC	Total	-	-	-	-	-	-	-	-
		PC	-	-	-	-	-	-	-	-
d)	Total	Total	2587	2045	2198	6830	1475	1151	1245	3881
		PC	9.1	7.1	2.7	4.9	5.2	4.0	1.5	2.7

			Summer				Winter			
			Male	Female	Children	Total	Male	Female	Children	Total
III.	**HYDERABAD**									
a)	JJC	Total	1776	1384	1369	4529	1291	1019	993	3303
		PC	6.9	4.9	1.7	3.4	5.0	3.6	1.3	2.4
b)	UAC	Total	652	460	585	1697	489	373	350	1212
		PC	7.3	5.1	2.2	3.8	5.5	4.2	1.4	2.7
c)	RSC	Total	649	462	527	1638	521	381	407	1309
		PC	8.2	5.6	2.2	4.1	6.6	4.7	1.7	3.2
d)	Total	Total	3077	2306	2481	7864	2301	1773	1750	5824
		PC	6.6	5.0	1.9	3.5	4.9	3.9	1.4	2.7
	TOTAL									
a)	JJC	Total	4542	3510	3586	11638	2889	2244	2211	7344
		PC	8.0	5.0	2.1	4.1	5.1	3.8	1.3	2.5
b)	UAC	Total	3371	2643	2787	8801	2005	1564	1592	5161
		PC	9.0	7.0	2.6	4.8	5.3	4.1	1.5	2.8
c)	RSC	Total	2099	1534	1622	5295	1304	976	1030	3310
		PC	9.1	6.6	2.3	4.4	5.7	4.2	1.4	2.8
d)	Total	Total	10012	7687	8035	25734	6198	4784	4833	15815
		PC	8.5	6.4	2.3	4.4	5.3	4.0	1.4	2.6

(Litres per day)

			Monsoon				Average Water Consumption			
			Male	Female	Children	Total	Male	Female	Children	Total
I.	**DELHI**									
a)	JJC	Total	681	524	486	1691	906	688	663	2257
		PC	4.9	3.9	1.2	2.5	6.5	5.1	1.6	3.3
b)	UAC	Total	940	730	719	2389	1211	957	935	3103
		PC	5.4	4.2	1.5	2.8	6.9	5.5	1.9	3.7
c)	RSC	Total	788	611	675	2074	1040	782	833	2655
		PC	5.2	4.1	1.4	2.7	6.9	5.2	1.7	3.4
d)	Total	Total	2409	1865	1880	6154	3157	2427	2427	2431
		PC	5.2	4.1	1.4	2.7	6.8	5.3	1.8	3.5
II.	**GHAZIABAD**									
a)	JJC	Total	961	738	807	2506	1151	892	957	3000
		PC	5.6	4.2	1.7	3.0	6.7	5.1	2.0	3.6
b)	UAC	Total	613	496	575	1684	776	624	688	2088
		PC	5.5	4.4	1.7	3.0	6.9	5.6	2.0	3.7
c)	RSC	Total	–	–	–	–	–	–	–	–
		PC	–	–	–	–	–	–	–	–
d)	Total	Total	1574	1234	1382	4190	1927	1516	1645	5088
		PC	5.5	4.3	1.7	3.0	6.8	5.3	2.0	3.7

			Monsoon				Average Water Consumption			
			Male	Female	Children	Total	Male	Female	Children	Total
III.	**HYDERABAD**									
a)	JJC	Total	1178	947	862	2987	1449	1141	1104	3694
		PC	4.6	3.3	1.1	2.2	5.6	4.0	1.4	2.7
b)	UAC	Total	489	347	365	1201	611	400	443	1954
		PC	5.5	3.9	1.4	2.6	6.8	4.5	1.7	3.3
c)	RSC	Total	416	302	297	1015	544	392	425	1361
		PC	5.3	3.7	1.2	2.5	6.9	4.9	1.8	3.3
d)	Total	Total	2083	1596	1524	5203	2604	1933	1972	6509
		PC	4.5	3.5	1.2	2.4	5.6	4.2	1.5	3.0
	TOTAL									
a)	JJC	Total	2820	2200	2155	7184	3506	2721	2724	8951
		PC	5.0	3.7	1.3	2.5	6.2	4.6	1.6	3.1
b)	UAC	Total	2042	1573	1659	5274	2598	1981	2066	6645
		PC	5.4	4.2	1.5	2.9	6.9	5.2	1.9	3.6
c)	RSC	Total	1204	913	972	3089	1584	1174	1252	4016
		PC	5.2	9.0	1.4	2.5	6.9	5.1	1.8	3.4
d)	Total	Total	6066	4695	4786	15547	7688	5876	6048	19612
		PC	5.2	3.9	1.4	2.6	6.5	4.9	1.7	3.3

NOTE: JJC : Jhuggi Jhopri Cluster   UAC : Unauthorised Colony
          RSC : Resettlement Colony
          PC : Per Capita

CHART - E

DAILY DRINKING WATER CONSUMPTION
(LPD Per Capita)

Legend: ⊘ DELHI ⊠ GHAZIABAD ⊞ HYDERABAD ⊠ TOTAL

X-axis categories: Male, Female, Children, Total
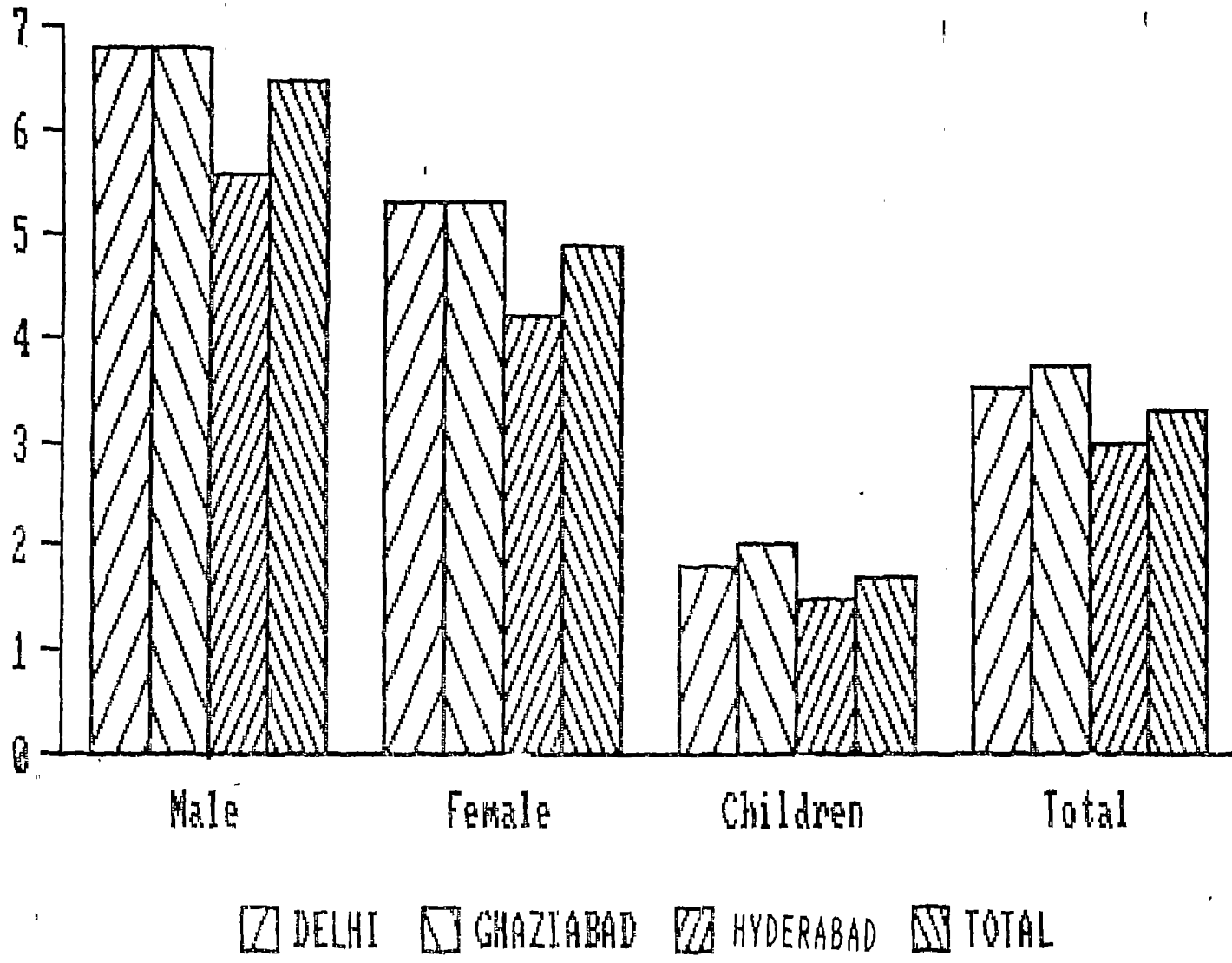
68-A

Table IV. 7 **Structure of Daily Drinking Water Consumption in SDS** Sample Households

(Percent)

		Summer				Winter			
		Male	Female	Children	Total	Male	Female	Children	Total
I.	**DELHI**								
a)	JJC	39.8	30.1	30.1	100.0	40.7	30.9	28.4	100.0
b)	UAC	38.8	31.1	30.1	100.0	39.1	30.6	30.3	100.0
c)	RSC	39.6	29.3	31.0	100.0	39.2	29.7	31.1	100.0
d)	Total	39.4	30.2	30.4	100.0	39.6	30.4	30.0	100.0
II.	**GHAZIABAD**								
a)	JJC	38.2	29.8	32.0	100.0	38.7	29.9	31.4	100.0
b)	UAC	37.4	30.2	32.4	100.0	37.3	29.6	33.1	100.0
c)	RSC	–	–	–	–	–	–	–	–
d)	Total	37.9	29.9	32.2	100.0	38.1	29.7	32.2	100.0
III.	**HYDERABAD**								
a)	JJC	39.2	30.6	30.2	100.0	39.1	30.9	30.0	100.0
b)	UAC	38.4	27.1	34.5	100.0	40.3	30.8	28.9	100.0
c)	RSC	39.6	28.2	32.2	100.0	39.8	29.1	31.1	100.0
d)	Total	39.1	29.3	31.6	100.0	39.5	30.5	30.0	100.0

		Summer				Winter			
		Male	Female	Children	Total	Male	Female	Children	Total
	TOTAL								
a)	JJC	39.0	30.2	30.8	100.0	39.3	30.5	30.2	100.0
b)	UAC	38.3	30.0	31.7	100.0	38.8	30.3	30.9	100.0
c)	PSC	39.6	29.0	31.4	100.0	39.4	29.5	31.1	100.0
d)	Total	38.9	29.9	31.2	100.0	39.2	30.2	30.6	100.0

		Monsoon				Total			
		Male	Female	Children	Total	Male	Female	Children	Total
I.	**DELHI**								
a)	JJC	40.3	31.0	28.7	100.00	40.1	30.5	29.4	100.00
b)	UAC	39.3	30.6	30.1	100.00	39.0	30.8	30.1	100.00
c)	RSC	38.0	29.5	32.5	100.00	39.2	29.4	31.4	100.00
d)	Total	39.2	30.3	30.5	100.00	39.4	30.3	30.3	100.00
II.	**GHAZIABAD**								
a)	JJC	38.3	29.5	32.2	100.00	38.4	29.7	31.9	100.00
b)	UAC	36.4	29.5	34.1	100.00	37.1	29.9	33.0	100.00
c)	RSC	–	–	–	–	–	–	–	–
d)	Total	37.6	29.5	32.9	100.00	37.9	29.8	32.3	100.00
III.	**HYDERABAD**								
a)	JJC	39.4	31.7	28.9	100.00	39.2	30.9	29.9	100.00
b)	UAC	40.7	28.9	30.4	100.00	42.0	27.5	30.5	100.00
c)	RSC	41.0	29.8	29.2	100.00	40.0	28.8	31.2	100.00
d)	Total	40.0	30.7	29.3	100.00	40.0	29.7	30.3	100.00

(Percent)

		Monsoon				Total			
		Male	Female	Children	Total	Male	Female	Children	Total
	TOTAL								
a)	JJC	39.3	30.7	30.0	100.00	39.2	30.4	30.1	100.00
b)	UAC	38.7	29.8	31.5	100.00	39.1	29.8	31.1	100.00
c)	RSC	39.0	29.5	31.5	100.00	39.5	29.2	31.3	100.00
d)	Total	39.0	30.2	30.8	100.00	39.2	30.0	30.8	100.00

NOTE :

JJC- Jhuggi Jhopri Cluster

UAC - Unauthorized Colony

RSC- Resettlement Colony

The average per capita consumption of water on an annual basis is 3.3 litres but it declines to 2.6 litres during the monsoon and winter months and rises to 4.4 litres in summer months. At the city level, the household consumption of water is 2.4 LPD in monsoon, 2.7 LPD in winter and 3.5 LPD in summer in Hyderabad, 3.0 LPD, 2.7 LPD and 4.9 LPD in the respective seasons in Ghazia-bad and 2.7 LPD in monsoon and winter and 4.8 LPD in summer months in Delhi.

The male dominance in water consumption comes out from the sex-wise distribution of water consumption data. Over the year, a male adult member of the urban informal sector household consumes on the average 6.5 LPD, whereas the female counterpart consumes only 4.9 LPD and children consume 1.7 LPD. During the summer months, adult male consumption is as high as 8.5 LPD, adult women consumption 6.4 LPD and children consume 2.3 LPD. In the monsoon and winter months, the respective consumption is at much lower levels but the pattern of sex-wise and adult-child consumption remains unchanged. One issue which these data establish is that the general belief that children are inclined to waste water, par-ticularly in slum settlements where there is hardly any opportunity for them to play (as the term is generally understood), is unfoun-ded.

6.   Role of Women in Water Collection System

As the major source of water in the urban informal settle-ment is community-based rather than house-based, water has to be collected and brought to the dwelling unit. Even if the source of supply is near the dwelling unit, efforts in terms of human labour and time is required to fill the vessels for storing the water within the dwelling unit. The time input is determined by the ave-rage number of residents who are dependent on a specific water source, either tap or hand pump. Other determinants are the hours of water supply and the pressure in the water mains.

An analysis of the data on the "water carrying" mechanism in the urban informal settlements reveals that 76.0 per cent of the water is collected by the female members of the household, 23.2 per cent by the children and 0.7 per cent by the male member On an average, a female member spends 3.8 hours daily to collect the water for family needs and children spend, on the average, 2 hours per day for this purpose. The adult males contribute a negligible time input, none in the case of RSC, less than an hour per day in the case of JJC and 20 to 30 minutes per:day in the case of UAC (Table IV.8).

The data on the water collection/delivery system brings out the pivotal role of women's input. They not only collect the water but also regulate its use and are found to be the most effective conservation agent. The whole system is built on her efforts which absorbs 25.0 per cent to 35.0 per cent of normal time that can be used for gainful employment (Table IV.9). If one expects the female socio-economic profile in the urban informal settlement to improve, their role in the water collection system will need to be kept in perspective and attempt made to reduce the labour input in the water collection system. At the same time, a special role should be worked out for women in any water conservation programme that may be formulated (See Chart - F).

7.   Income and Water Consumption :   Some Relationship

It is normally difficult to envisage any relationship between the quantum of water consumption and level of income as the general feeling is that water consumption is a direct function of the household size and its composition, the type of activity in which the household is engaged, and the seasonal conditions. The present study has presented some evidences earlier in this chapter on the role of these determinants on water consumption. However, the SDS data on water consumption by households in different income groups, as measured by the income of the head of household, also suggest that there could be some impact of the level of income on water consumption.

Table IV.8 <u>Role of Household Members in Water Collection System</u>

(Percent)

		JJC	UAC	RSC	Total
1.	Male	1.7	0.3	-	0.7
2.	Female	73.3	75.0	80.0	76.1
3.	Children	25.0	24.7	20.0	23.2
Total		100.0	100.0	100.0	100.0

Note : JJC :Jhuggi Jhopri Cluster

UAC :Unauthorised Colony

RSC :Resettlement Colony

Table IV.9 <u>Time Spent on Water Collection by Household Members</u>

(Average hours)

		JJC	UAC	RSC	Total
1.	Male	1.0	0.2	-	N
2.	Female	4.0	3.5	4.0	3.8
3.	Children	2.0	2.0	2.0	2.0

Note : JJC :Jhuggi Jhopri Cluster

UAC :Unauthorised Colony

RSC :Resettlement Colony

N   :Negligible

ROLE OF HOUSEHOLD MEMBERS
IN WATER COLLECTION (Percent)

CHART - F

75-A
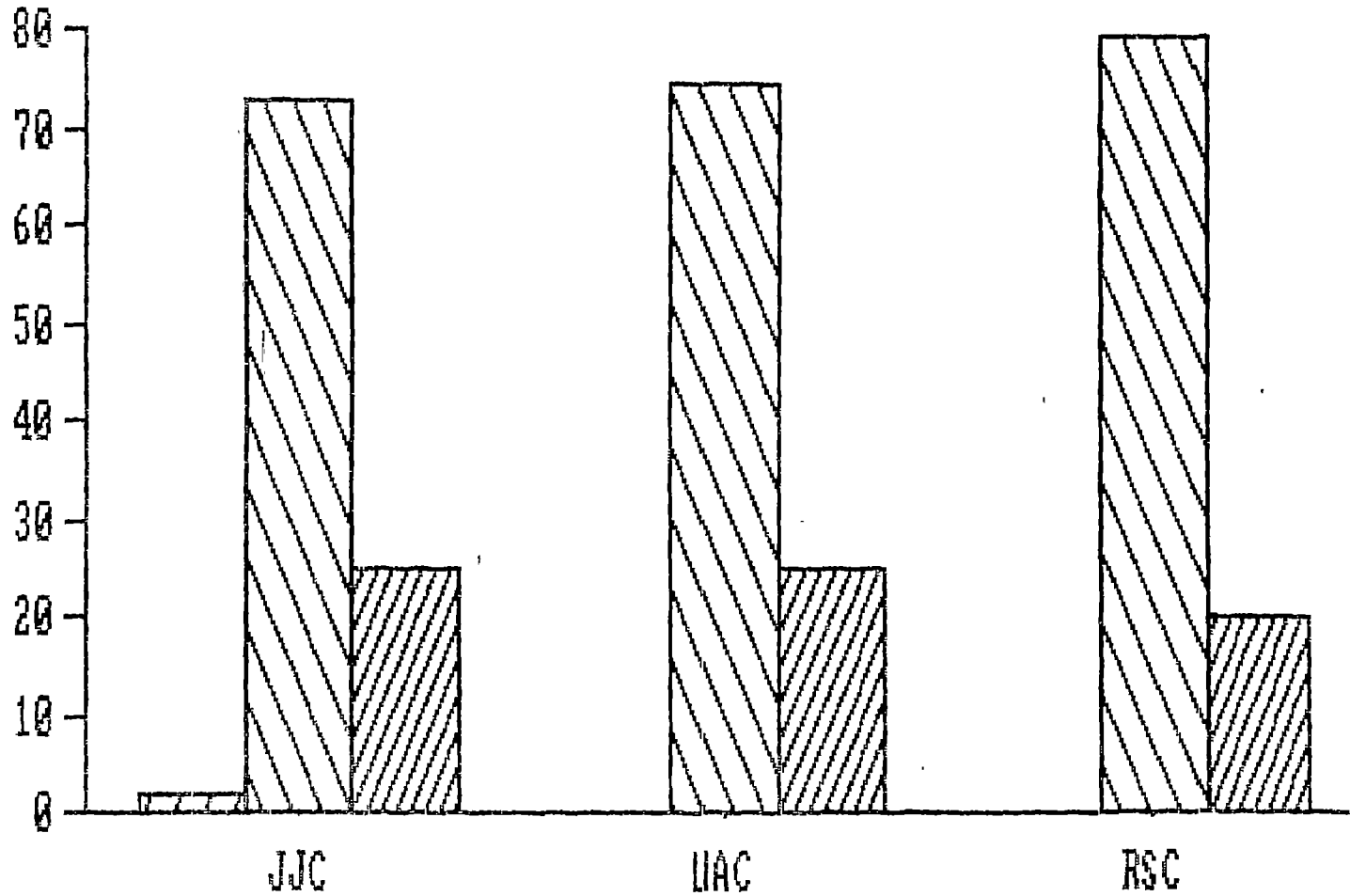
MALE FEMALE CHILDREN

Water consumption data by the five income groups in which the SDS households have been classified, are presented in Table IV.10. They serve to confirm the positive relationship between water consumption and level of income. At the level of the SDS sample for the three cities of Delhi, Ghaziabad and Hyderabad taken together, the average water consumption goes up from 111 LPD for households in the income group upto-Rs.500 to 129 LPD in income group Rs.501 - Rs.1000, 185 LPD in income group Rs.1001-Rs.1500, 211 LPD in income group Rs.1501 - Rs.2000 and 224 LPD in income group Rs.2000-plus. This pattern is seen for all three categories of housing settlement. The disparity is most significant in the RSC households, where the average water consumption is 186 LPD for the income group upto-Rs.500 and 258 LPD for income group Rs.2000-plus. The disparity is the least in the JJC, the household consumption ranging from 112 LPD to 153 LPD.

The economic rationale for this apparent linkage is that with improvement in the level of income, the household buys more clothes and household utensils and also acquires durables like water cooler, cycle, scooter, etc., which also make demand on water. The water storage capacity of the household also improves with income. Another contributing factor is the impact of radio and television, which can be acquired with improvement in income and this exposes the household continually to the desirability of maintaining personal hygiene and cleanliness.

Interaction with households revealed that exposure to television has generated a desire among them to wash cereals and vegetables two or three times before cooking, rather than once or not at all in some cases, before exposure to the electronic media. The people have also realised that washed cereals contribute to better family health. The same applies to more frequent washing of clothes and improved personal hygiene.

Table IV.10   Average Water Consumption in Different

Income Groups in SDS Sample Households

(Litres per day)

	Upto 500	501-1000	1001-1500	1501-2000	2000 plus	Total
1. Delhi						
JJC	94	115	130	154	-	114
UAC	114	171	196	191	232	183
RSC	186	210	232	230	258	216
Total	112	164	195	205	239	173
2. Ghaziabad						
JJC	115	131	142	152	-	130
UAC	100	141	170	170	158	146
RSC	-	-	-	-	-	-
Total	110	134	160	165	158	137
3. Hyderabad						
JJC	112	106	-	-	-	107
UAC	92	91	-	-	-	91
RSC	-	88	-	-	-	88
Total	107	98	-	-	-	100
4. TOTAL						
JJC	112	116	136	153	-	116
UAC	95	134	187	187	213	147
RSC	186	151	232	230	258	169
Total	111	129	185	211	224	137

Note: JJC   :   Jhuggi Jhopri Cluster

UAC   :   Unauthorised Colony

RSC   :   Resettlement   Colony

8.   Projected Water Consumption

        SDS has made some projections on water consumption at
the household level for the year. These projections, together
with the existing water consumption scenario are presented in
Table IV.11. The projected increase is 65.0 per cent over a
period of 5-10 years. It is projected that the average house-
hold water consumption will increase from 137 LPD in 1990 to
225 LPD in the future. The increase is projected to be the maxi-
mum for JJC (78.4 per cent) but even then the daily water con-
sumption by JJC households will remain less than that of UAC
and RSC households. Projected increase in water consumption is
the maximum in Hyderabad where the present level of daily water
consumption is extremely low. The projected increase in Ghazia-
bad is the minimum, daily water consumption at the town level is
expected to rise from 137 LPD to 180 LPD (31.7 per cent increase).

9.   Affordability, Public Revenue and Related Issues

        During the course of interaction with the sample house-
holds, the SDS survey team were able to obtain some insight into
the desire of the households to make regular payments for supply
of water through the public distribution system or any other water
supply delivery system, including by tanker, or from tube well and
hand pump, though the preference would be to receive piped water
directly in the dwelling unit. As a welfare measure, the local
bodies in the survey towns have tried to provide some sources of
water supply for informal sector settlements but more often than
not the source and frequency of supply is too inadequate to meet
the entire needs of the slum dwellers. An improved water delivery
system appears to be a major stimulating factor that would induce
the household to make a regular payment and the levels of payment
which the people are volunteering to make for such a service is
higher than what they are presently paying to either some public
or private agency for meeting their water needs or are presently
incurring as an expenditure to maintain an existing hand pump and
tube well which they may have installed either on individual or
community basis.

Table IV.11: Projected Increase in Water Consumption

(Average litres per day per household)

	Delhi				Ghaziabad				Hyderabad				Total			
	JJC	UAC	RSC	Total	JJC	UAC	RSC	Total	JJC	UAC	RSC	Total	JJC	UAC	RSC	Total
1. Present Water Consumption	114	183	216	173	130	146	–	137	107	91	88	100	116	147	169	137
2. Projected Water Consumption	167	270	309	251	166	199	–	180	255	177	210	229	207	223	272	225
3. Percent Increase	46.5	47.5	43.0	45.0	27.7	36.3	–	31.7	136.7	93.5	139.0	128.4	78.4	51.7	61.3	64.7

Note :

JJC : Jhuggi Jhopri Cluster

UAC : Unauthorised Colony

RSC : Resettlement Colony

For instance, a community tap is provided for more than 40 households and supply limited to 2-4 hours daily which is found to be too insufficient. Therefore, some of the households jointly contribute an amount of about Rs.3000 to Rs.4000 to install a hand pump which meets, on an average, the water needs of 10 to 15 households. This is a very common scene in the JJC and UAC in all the three sample cities. However, the operational costs of the hand pump becomes a real burden. Due to continuous use by the participating households, and often others also, the hand pump often goes out of order and, on average, Rs.150 to Rs.200 is spent monthly for its repair and maintenance. This cost is also shared by all the households, the average monthly household contribution bring around Rs.15.

It was revealed during the course of discussions that the households would prefer paying the same monthly amount or even more for piped water supply provided by municipal or local authorities as they would be assured supply of safe water. Hand pump water is not always, and necessarily, of good quality and access to good water may require very deep boring which raises the initial capital cost. Thus, in JJCs and UACs in South Delhi, good water may need, at times, more than 75 ft. boring, in Trans-Yamuna areas, around 60 ft. and in West Delhi, due to the highly rocky terrain, even more than 100 ft.

In all the UAC in Delhi and Ghaziabad, it was pointed out by the respondents that many of them have been able to get piped water connection through the main pipeline by paying amounts generally exceeding Rs.500 to the concerned person in the municipal corporation. To keep the illegal connection uninterrupted, the concerned household has to make unofficial payments of about Rs.50 to Rs.60 per connection at regular intervals of 3 to 4 months. SDS has estimated that "annual connection maintenance charge" of Rs.150 to Rs.250 or Rs.12 to Rs.20 per month, which is required to maintain an illegal water connection, works out to be cheaper than cost of water supply on regular meter basis, as no meter charges have to be paid on illegal and therefore unmetered connections.

The situation is comparatively better in RSC in Delhi, where after the outbreak of cholera in 1987, the authorities removed all personal hand pumps and provided the households with piped water supply system at a fixed monthly charge of Rs.9 to Rs.13 per household. The total expenditure on water at the aggregate level is expected to increase substantially if an improved water supply delivery system is developed.

Table IV.12 presents some of the quantitative assessment of the SDS on projected impact of improved water supply delivery system on paying habits of the households and the amount of payment they would be willing to make on a voluntary basis. These data show that 41.2 per cent (more than two-fifth) of the SDS sample households presently make some payment for meeting their present water needs. The average monthly payment is estimated to be Rs.12 and the total monthly payment of the 433 households who make some payment is Rs.5040. At the overall level of the SDS sample the monthly payment by individual household ranges from Rs.10 in JJC to Rs.11 in RSC and Rs.13 in UAC. At the town level, the lowest monthly expenditure is Rs.7 in the JJC of Ghaziabad, where 28.7 per cent of such households incur an expenditure on water.

One important implication of the expenditure data on water consumption is that almost three-fifth of the households in the urban informal settlements do not presently incur any expenditure on water consumption but the majority of these households have expressed willingness to make some payment if the supply of water is more assured and regular. SDS data presented in Table IV.12 & Chart-G indicate that 96.3 per cent of the SDS households (1011 out of 1050) are keen to make some payment or incur expenditure on water, and the average amount of such possible payment is Rs.15 per month per household, subject to the condition that water is made available on a regular basis. In other words, the potential to mobilise funding for water schemes, particularly for drinking water, is very high in the urban informal settlements. As per the estimates made by SDS, the projected expenditure on water can increase by more than three times from an average monthly amount of Rs.5040 to Rs.15,550 for the SDS sample. The per household average expenditure

Table IV. 12   Projected Impact on Paying Habits with
Improved Water Supply Delivery System

		Delhi				Ghaziabad			
		JJC	UAC	RSC	Total	JJC	UAC	RSC	Total
I.	a.	42 (34.1)	138 (96.5)	134 (100.0)	314 (78.5)	43 (28.7)	74 (74.0)	–	117 (46.8)
	b.	12	12	11	12	7	13	–	11
	c.	500	1700	1500	3700	300	1000	–	1300
II.	a	123 (100.0)	143 (100.0)	134 (100.0)	400 (100.0)	150 (100.0)	100 (100.0)	–	250
	b.	15	24	12	17	16	16	–	16
	c.	1800	3400	1600	6800	2400	1600	–	4000
III.	a	193.0	3.5	–	27.4	248.8	35.1	–	113.7
	b	25.0	100.0	9.0	41.7	128.6	23.1	–	45.5
	c.	260.0	100.0	9.0	83.8	700.0	60.0	–	207.7

		Hyderabad				Total			
		JJC	UAC	RSC	Total	JJC	UAC	RSC	Total
I.	a.	2 (0.9)	-	-	2 (o.5)	87 (17.2)	212 (63.8)	134 (62.9)	433 (41.2)
	b	20	-	-	20	10	13	11	12
	c.	40	-	-	40	840	2700	1500	5040
II.	a	194 (83.6)	89 (100.0)	78 (98.7)	361 (90.3)	467 (92.5)	332 (100.0)	212 (99.5)	1011 (96.3)
	b	12	14	15	13	14	19	13	15
	c	2300	1250	1200	4750	6500	6250	2800	15550
III.	a	9600.0	-	-	17950	436.8	56.6	58.2	133.5
	b.	40.0	-	-	35.0	40.0	46.2	18.2	25.2
	c.	5650.0	-	-	11775.0	673.8	131.5	86.7	208.5

Note:

I. Number of households spending atleast some amount on water under existing water supply system.

II. Number of households willing to spend on water under an improved water supply system.

III. Percent increase for item I and II.

Figures in parentheses are percent of total sample households in respective category.

a. Number of households.   b. Average monthly amount in Rs. spent on water per household.

c. Total monthly amount in rupees paid by total sample households.

JJC - Jhuggi Jhopri Cluster.
UAC - Unauthorised Colony
RSC - Resettlement Colony.

PROJECTED IMPACT ON PAYING HABITS WITH IMPROVED WATER SUPPLY - DELHI
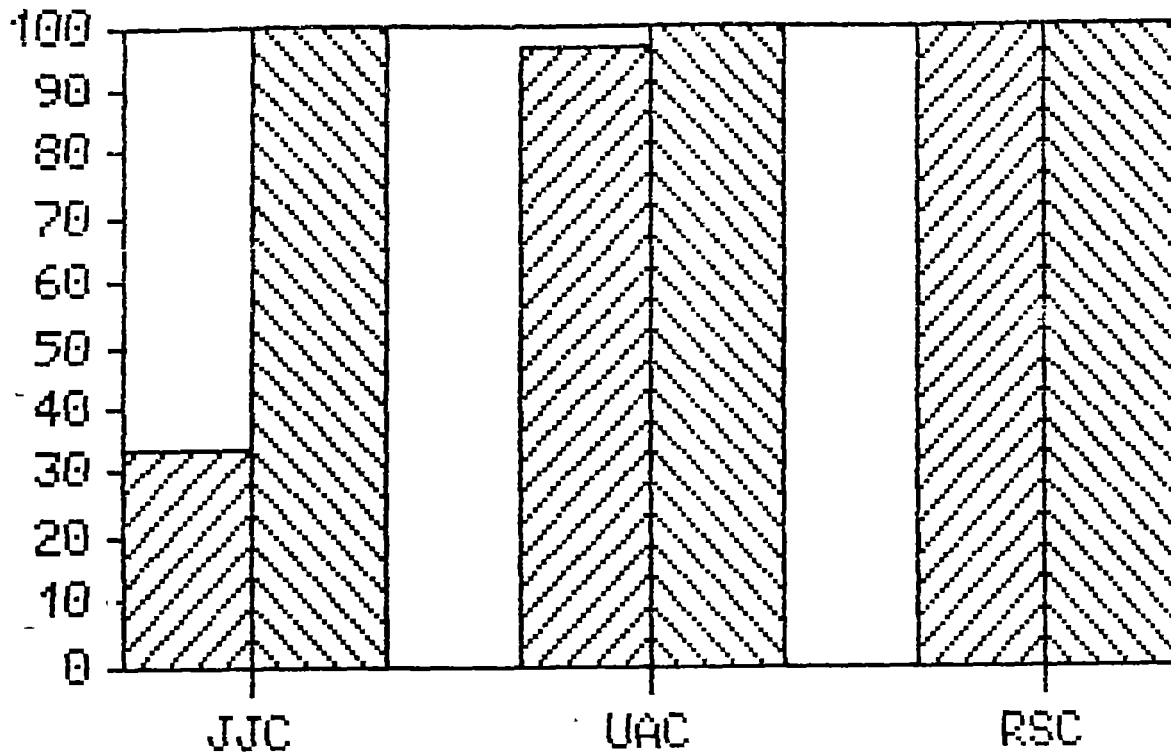
GHAZIABAD
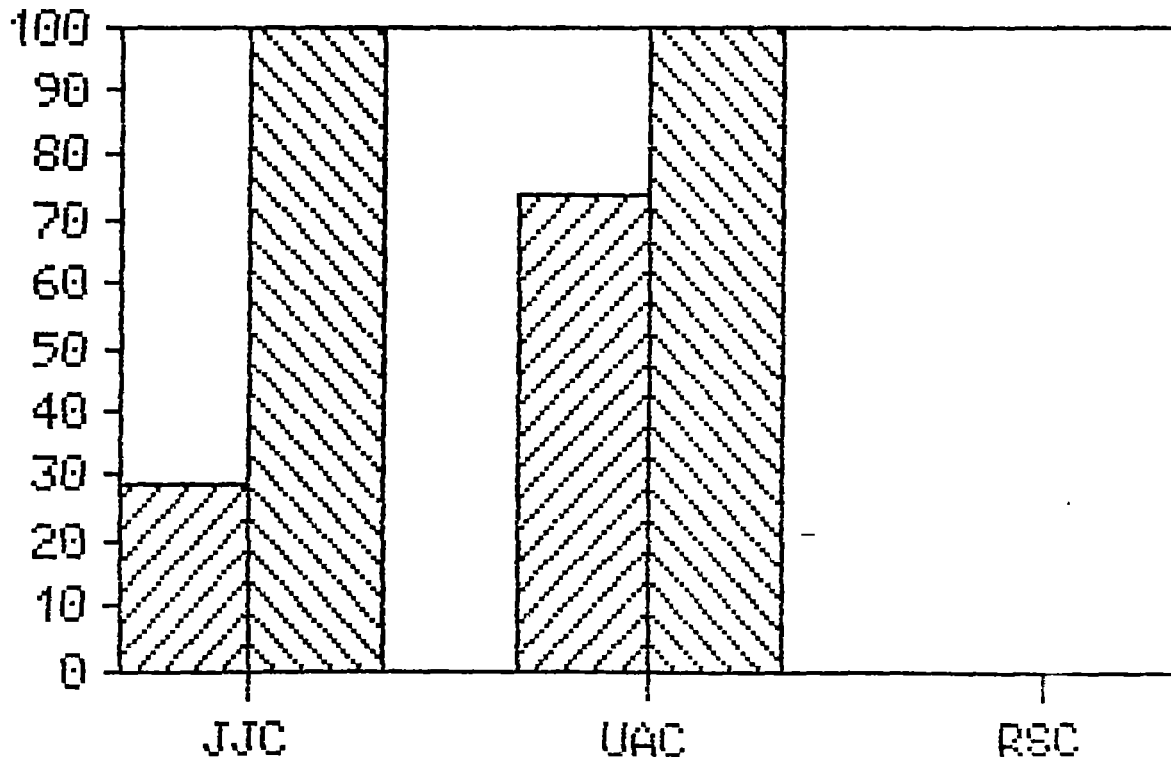
PRESENT PERCENTAGE OF PAYING POPULATION   PROJECTED PERCENTAGE OF PAYING POPULATION

PROJECTED IMPACT ON PAYING HABITS WITH IMPROVED WATER SUPPLY — HYDERABAD
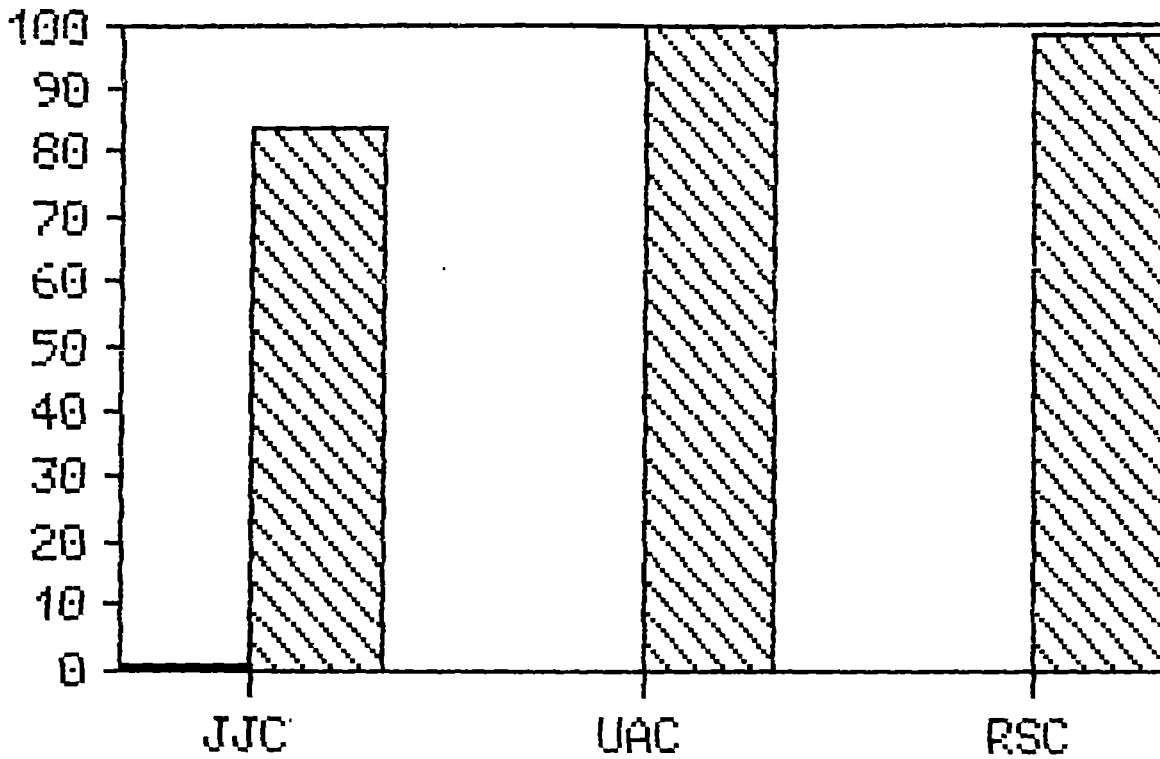
TOTAL
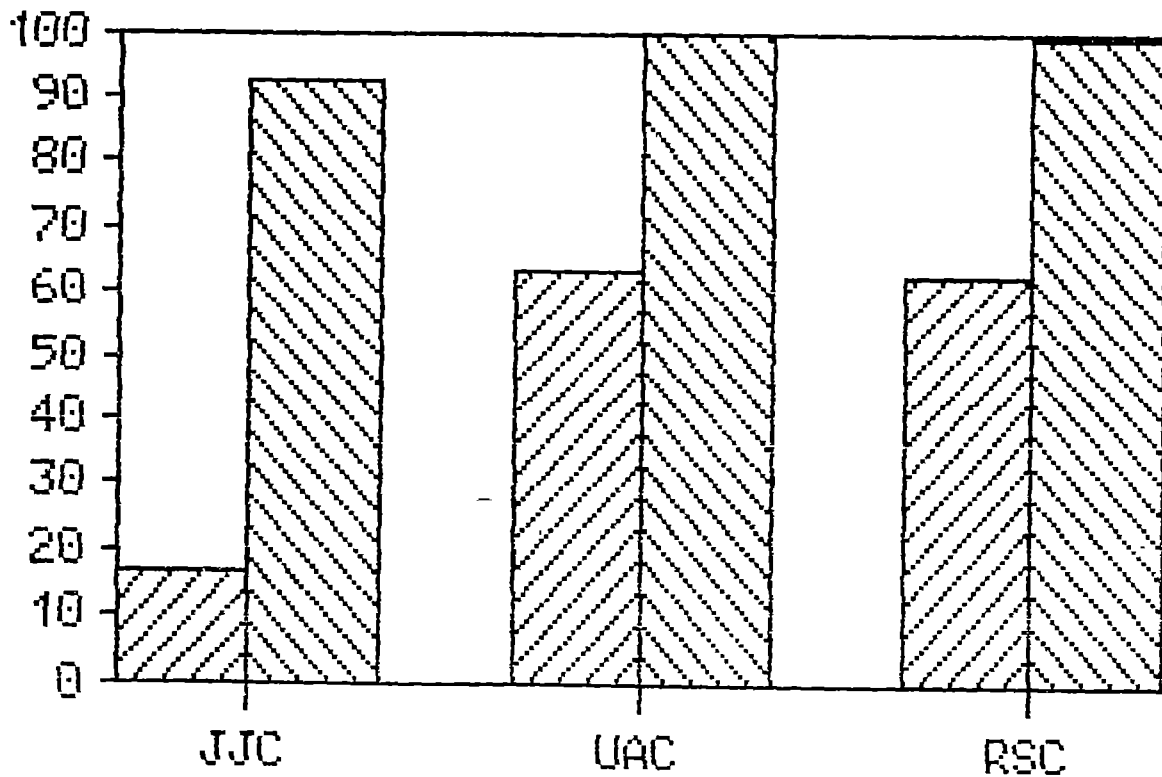
PRESENT PERCENTAGE   PROJECTED PERCENTAGE

will go up from Rs.12 per month to Rs.15 per month, that is, an increase of 25.0 per cent.

While one cannot come to any definite conclusion on the affordability capacity of people to pay for water or on the likely resources that can be generated through an improved water delivery system, the SDS data clearly suggest that there exists potential and willingness on the part of people to pay for their water requirements. This basic feedback on people's perception points to the urgency of their water needs and their own assessed capacity to pay, which could give some indications on the priority to be given to developing an adequate water supply strategy on the basis of partial payment in the initial years and, hopefully, eliminating subsidy over the long run.

In this context, it might be mentioned that Delhi Development ment Authority presently charges in its prestigious Vasant Kunj colony, where average monthly household income is expected to be Rs.4000-plus, a flat rate of Rs.10 per apartment per month for water, irrespective of the size of the flat, size of household, number of rooms and water connections. During the course of the field survey, the SDS team found that in all the three sample RSCs located at Delhi, in the absence of metered water supply system, the flat rate ranges from Rs.9 to Rs.13 per month for each dwelling unit irrespective of the level of water consumption. Water is supplied through direct individual pipe connection in each of the dwelling units. In most of these RSCs, water supply is for 20 to 24 hours. In fact, in view of this highly subsidised system of water supply, the households who have an average monthly household income of Rs.1013 have developed a habit of over-utilising water and are keen to opt for non-meter water supply. Such households have indicated the least increase in their projected payments for water, from an average of Rs.11 per month to Rs.12 per month (or 9.0 per cent increase). This projected increase can be considered extremely low when compared to a projected increase of 25.0 per cent by JJC household and 100.0 per cent by UAC households.

V : ECONOMIC ACTIVITIES, WATER CONSUMPTION AND
AFFORDABILITY OF MICRO ENTERPRISES IN SLUM
SETTLEMENTS

1. Relevance for Water Management Policy

Assessment of water needs of urban informal settlements
needs to be extended beyond the consumption needs of the house-
holds residing in the settlements to cover the micro enterprises
that also form an integral component of the settlement scenario.
There are two important distinctions between the water needs
of the household and the micro enterprises : the latter requires
water for commercial and industrial purposes which generate
income and the water requirement is dependent upon the type of
economic activity undertaken by the micro enterprise. In mix-
use informal settlements, there is, thus, scope for a pricing
policy to be evolved in such a manner that commercial activities
could partly cross-subsidise the water consumption at the
household level.

The settlement typology and end-use of the dwelling unit
is influenced by the composition of the settlement in terms of
households and micro enterprises. In the majority of informal
settlements, there is a mix of residential and commercial units.
The latter include mainly home-based production and servicing
activities, closely interlinked with the household economy as
well as some pockets of slum settlements which can be regarded
as full-fledged industrial and commercial settlements. It is
desirable that a water management and pricing policy for urban
informal settlements is, therefore, settlement-specific and
not formulated on across-the-board basis.

2. Micro Enterprise Sector

a. Activity Profile

A distinct characteristic of the SDS sample micro enter-
prises is that they are not so organised or regularised as to

be classified in the category of formal economic enterprises.
SDS data show that only 25.0 per cent of the micro units are
registered under some local regulation, the majority being
beyond their purview. There is a good mix of sole proprietor-
ship and partnership units in the micro enterprise sector.
Single-owner units, suggesting the home-based nature of activity,
are a prominent feature : 55.0 per cent in the SDS sample and
58.7 per cent in Delhi, 64.0 per cent in Ghaziabad and 45.3 per
cent in Hyderabad; the remaining are partnership units, generally
with 2 to 4 partners. Manufacturing is the main activity for
92.5 per cent of the sample units, with 6.5 per cent (mainly
in Ghaziabad and some in Hyderabad) being engaged in assembling
work. The main line of work can be categorised as metal
fabrication (steel, iron, aluminium, brass and copper) and the
work may involve processing, assembling and manufacturing
operations. Thus, for example, 76.0 per cent of the SDS sample
micro enterprises in Ghaziabad are involved in metal-based
activity, 69.3 per cent in Delhi and 40.0 per cent in Hyderabad.
Other activities are based on plastics, rubber and glass.

Table V.1 presents a profile of micro enterprises in the
SDS sample.

b. Entrepreneur Profile and Affordability Issue

The profile of the entrepreneur in the informal micro
enterprise sector, as per the SDS data, suggests a strong
probability of a continuing improvement in level of affordability
to pay for basic infrastructure and services, including water.
The entrepreneur in the three sample cities of Delhi, Ghaziabad
and Hyderabad is in the age group which can be considered, in
the case of informal micro enterprises, to represent an ascen-
ding profile. The entrepreneur has had at least 15 to 20 years
work experience, has operated the present micro enterprise

Table V.1 Salient Features of Micro Enterprises

	Delhi		Ghaziabad		Hyderabad		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
1. Registration Status								
a) Registered	39	52.0	11	22.0	--	--	50	25.0
b) Not Registered	36	48.0	39	78.0	75	100.0	150	75.0
2. Ownership Pattern								
a) Proprietorship	44	58:7	32	64.0	34	45.3	110	55.0
b) Partnership	31	41.3	18	36.0	41	54.7	90	45.0
3. Major Activity								
a) Manufacturing	75	100.0	37	74.0	73	97.3	185	92.5
b) Assembling	--	--	11	22.0	2	2.7	13	6.5
c) Trading	--	--	1	2.0	--	--	1	0.5
d) Others	--	--	1	2.0	--	--	1	0.5
4. Main Product Line								
a) Plastic Good	22	29.3	2	4.0	18	24.0	42	21.0
b) Metal Good	52	69.3	38	76.0	30	40.0	120	60.0
c) Leather Good	1	1.4	--	--	--	--	1	0.5
d) Others[1]	--	--	10	20.0	27	36.0	37	18.5
TOTAL	75	100.0	50	100.0	75	100.0	200	100.0

NOTE: 1. Includes activities in leather, pottery and ceramics

for around 8 to 9 years, and has reached a financial standing
that is indicative of a good capacity to pay for the services.
The average age of the SDS sample entrepreneur is 39 years and
it ranges from 36 to 41 in the three sample cities.

Some other salient characteristics of the micro enterprise
entrepreneur, which have a bearing on his "paying capacity",
are presented in Table V.2. Basically the entrepreneur is a
local man who was born in the same town (76.5 per cent), though
there is evidence that the entrepreneur category also includes
some second or third generation of earlier migrants. In Delhi,
however, more than two-fifth of the entrepreneurs were born
outside the capital city, generally from areas that now form
the National Capital Region ; the proportion of such entrepre-
neurs in Ghaziabad is about one-third but there are no such
entrepreneurs in the SDS sample enterprises in Hyderabad.
Another indicator of the "local" status of the entrepreneur is
their mother tongue : 97.0 to 98.0 per cent indicated Hindi
in Delhi and Ghaziabad, while in Hyderabad the mother tongue
is either Telugu or Urdu, the two local languages.

Apart from these 'local' characteristics of the entrepre-
neur, suggesting that he will continue to stay in the city and
further build up the enterprise, SDS data provide evidence on
a high degree of stability in the present location of the
enterprise. As many as 56.0 per cent of the entrepreneurs in
Delhi, 70.0 per cent in Ghaziabad and 98.7 per cent in Hyderabad
have been living in the present slum settlement since birth
and another 38.7 per cent in Delhi and 24.0 per cent in
Ghaziabad have been residents for more than 10 years. SDS
interaction with the entrepreneurs further revealed a strong
indication to continue and expand the activities at the present
site, and if necessary, also extend the operations elsewhere
in the city, preferably in the vicinity of the present location.

This "permanent" nature of the micro enterprise and the entrepreneur's residence is another indicator of a desire to contribute to the development of congenial infrastructural facilities in the settlement.

The data on literacy level of the sample entrepreneur suggest that he cannot be treated as illiterate. More than one-third of the entrepreneurs have even got some college-level education, two-fifth of them have studied upto high school level and more than one-fifth have completed primary school level. The literacy level of the sample entrepreneurs is an indicator of a fair possibility of absorption on their part of training input designed for skill upgradation. As at present, a small proportion, less than one-tenth, have received formal training, around one-fifth of them have received no training, formal or informal, and the majority of them (70.5 per cent) have acquired skill through hands-on experience. The proportion of the last category of entrepreneurs is highest in Delhi (93.3 per cent) (Table V.2).

c. Investment and Output in Micro Enterprises

In the ultimate analysis, the affordability to pay for basic services depends on the financial viability of the enterprises and their growth potential. A few financial indicators are examined for this purpose.

The micro enterprise entrepreneur has been operating the existing unit for about 8 to 9 years. The initial investment of the average sample micro enterprise, made about 8 to 9 years ago, is estimated at Rs.36,700; the total investment of the 200 SDS sample micro enterprises at time of their establishment is estimated at Rs.73.5 lakh. Bulk of the investment was made in Delhi (58.5 per cent), followed by Ghaziabad (37.8 per cent), with the investment in Hyderabad forming a small proportion

TableV.2 Profile of Micro Enterprise Entrepreneur

	Delhi		Ghaziabad		Hyderabad		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
1. Respondent Age								
a) No	75	37.5	50	25.0	75	37.5	200	100.0
b) Average (years)	41		40		36		39	
2. Place of Birth								
a) Same Town	44	58.7	34	68.0	75	100.0	153	76.5
b) Other Town	31	41.3	16	32.0	--	--	47	23.5
3. Mother Tongue								
a) Hindi	73	97.3	49	98.0	--	--	122	61.0
b) Other than Hindi	2	2.7	1	2.0	75	100.0[1]	78	39.0
4. Period of Stay in Present Location								
a) Since Birth	42	56.0	35	70.0	74	98.7	151	75.5
b) 1-5 years	1	1.3	--	--	1	1.3	2	1.0
c) 6-10 years	3	4.0	3	6.0	--	--	6	3.0
d) More than 10 years	29	38.7	12	24.0	--	--	41	20.5

	Delhi		Ghaziabad		Hyderabad		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent

5. Education

a) Illiterate/ Semi-Literate	--	--	--	--	--	--	--	--
b) Primary	14	18.7	9	18.0	17	22.7	40	20.0
c) High School	34	45.3	19	38.0	32	42.7	85	42.5
d) College	27	36.0	22	44.0	26	34.6	75	37.5

6. Training

a) None	5	6.7	4	8.0	33	44.0	42	21.0
b) Formal	--	--	6	12.0	11	14.7	17	8.5
c) Informal	70	93.3	40	80.0	31	41.3	141	70.5
TOTAL 2	75	100.0	50	100.0	75	100.0	200	100.0

Note: 1) Telegu and Urdu

2) Total of each sub-group 2,3,4,5 & 6.

(3.8 per cent) of the initial investment of the SDS sample
units. The per unit initial investment is fairly comparable
in Delhi and Ghaziabad (Rs.57,300 and Rs.55,400) but is very
modest in Hyderabad (Rs.3,800). While all the units in Hydera-
bad can be classified as tiny units, in Ghaziabad and in Delhi,
41.3 per cent and 44.0 per cent of the units, respectively,
started with an initial investment of more than Rs.50,000 and
these units account for 64.3 per cent and 66.6 per cent,
respectively, of the total initial investment of micro enter-
prises in these two towns (Table V.3).

There has been considerable growth in investment in the
SDS sample micro enterprise sector over the last 8 to 9 years.
At the aggregate level, the increase is 180.1 per cent from
Rs.73.5 lakh to Rs.208.8 lakh, the annual growth in investment
being 21.9 per cent. The annual rate of growth of investment
ranges from 16.4 per cent to 23.2 per cent in the individual
cities. As a result of the high growth rate of micro enterprises,
none of them in Delhi presently has an investment of less than
Rs.50,000 and in Ghaziabad only 10.0 per cent of the sample
units have an investment of less than Rs.50,000. In Hyderabad,
on the other hand, there are no such large units, and the average
investment per unit is now Rs.9,100 (Tables V.3&4 and Chart - H).

The total monthly production of the SDS sample micro
enterprises is estimated at Rs.1 crore as against an estimated
installed capacity of Rs.68.1 lakh; capacity utilisation is,
thus, 147.7 per cent, and is suggestive of the level of effi-
ciency. While 41.0 per cent of the units have an average monthly
production of Rs.6,100, mainly the units in Hyderabad (91.5 per
cent), as many as 10.0 per cent of the sample units have monthly
production exceeding Rs.1 lakh and another one-third have
monthly production ranging from Rs.50,000 to Rs.1 lakh (Table
V.4).

Table V.3 : Investment, Output and Employment Generation in the Micro Enterprise Sector : Present Status and Projections

	Delhi	Ghaziabad	Hyderabad	Total
1. Unit Profile				
a. Number	75	50	75	200
b. Average age (yrs.)	8.9	7.7	8.5	8.4
c. Size (sq.ft.)	1034	1080	275	760
2. Investment				
a. Initial				
i. Total (Rs.lakh)	43.0	27.7	2.8	73.5
ii. Average (Rs.000)	57.3	55.4	3.8	36.7
b. Present (1990)				
i. Total (Rs.lakh)	132.0	70.0	6.8	208.8
ii. Average (Rs.000)	175.4	140.0	9.1	104.4
c. Projection (2000)				
i. Average (Rs.000)	340.0	383.0	15.1	228.9
3. Capacity				
a. Present (1990)				
i. Average (Rs.000)	109.9	99.6	5.3	68.1
b. Projection (2000)				
i. Average (Rs.000)	224.4	294.2	10.0	161.5
4. Monthly Output				
a. Present (1990)				
i. Total (Rs.lakh)	57.9	39.3	3.4	100.6
ii. Average (Rs.000)	77.1	78.5	4.5	50.3
b. Projection (2000)				
i. Average (Rs.000)	192.0	268.0	9.1	142.4
5. Employment (Average jobs per unit)				
a. Present (1990)	11.9	9.7	5.4	8.9
b. Projection (2000)	21.1	17.8	8.9	15.7
6. Annual Growth Rate (Percent)				
a. Investment				
i. Initial-1990	23.2	19.8	16.4	21.9
ii. 1990-2000	9.4	17.4	6.6	12.0
b. Capacity				
i. 1990-2000	10.4	22.6	8.9	13.7
c. Output				
i. 1990-2000	14.9	24.1	10.2	18.3
d. Employment				
i. 1990-2000	7.7	8.3	6.5	7.6

INVESTMENT (Average Amount Rs)

CAPACITY (Average Amount Rs)

▨ DELHI   ▨ GHAZIABAD   ▨ HYDERABAD   ▨ TOTAL

OUTPUT (Average Amount Rs)

300
250
200
150
100
50
0

PRESENT

PROJECTION

EMPLOYMENT GENERATION
(Number Per Unit)

22
20
18
16
14
12
10
8
6
4
2
0

PRESENT

PROJECTION
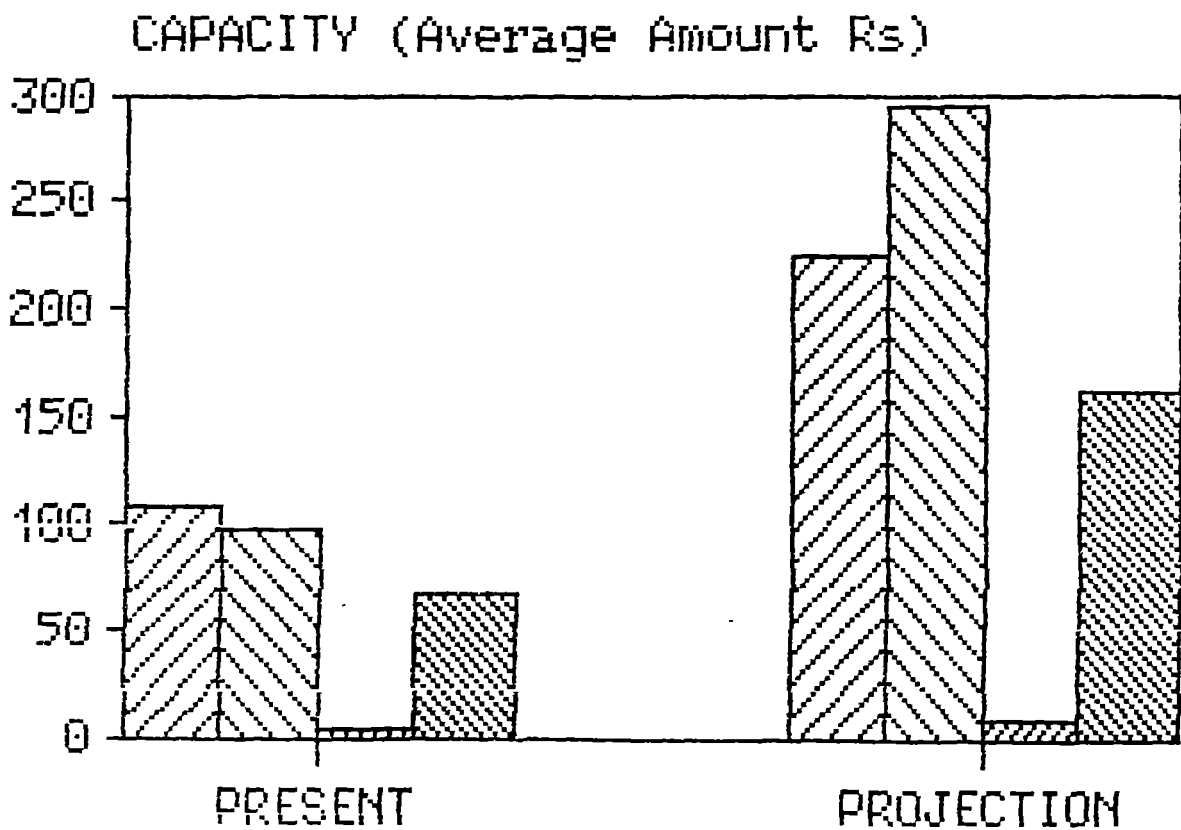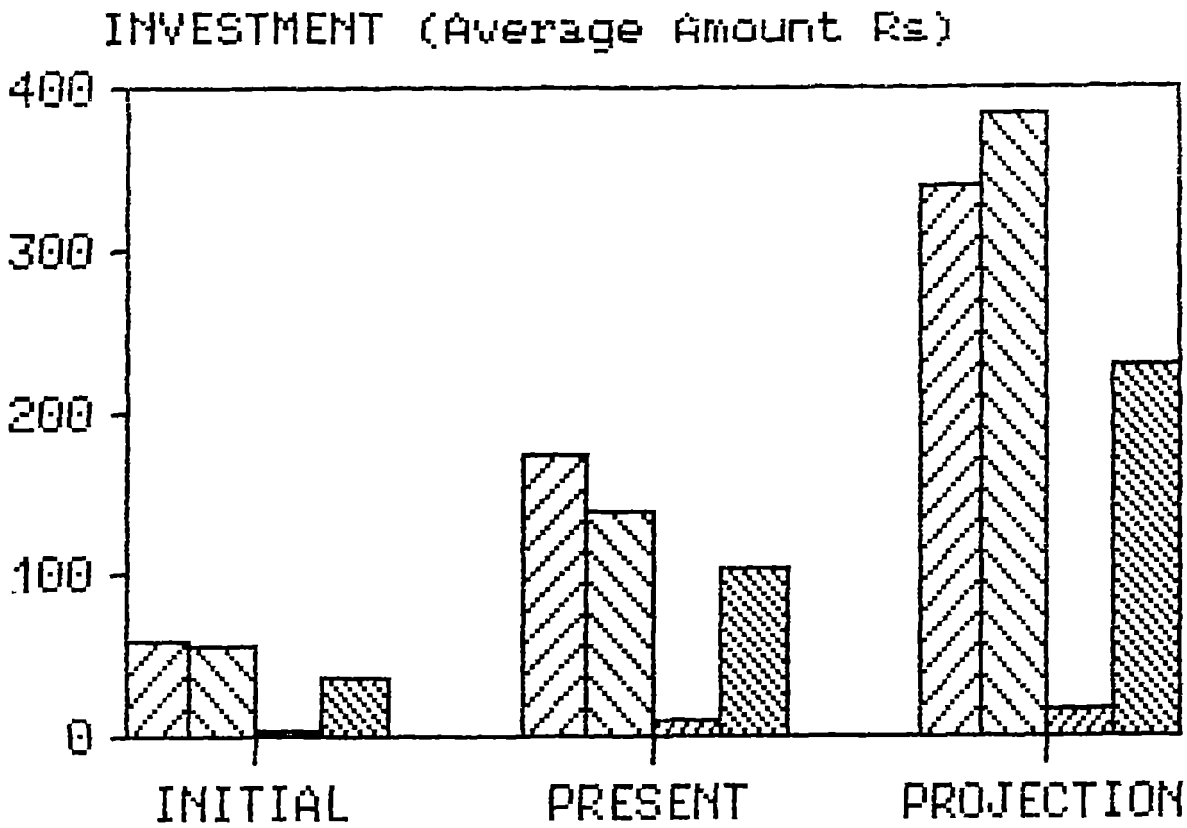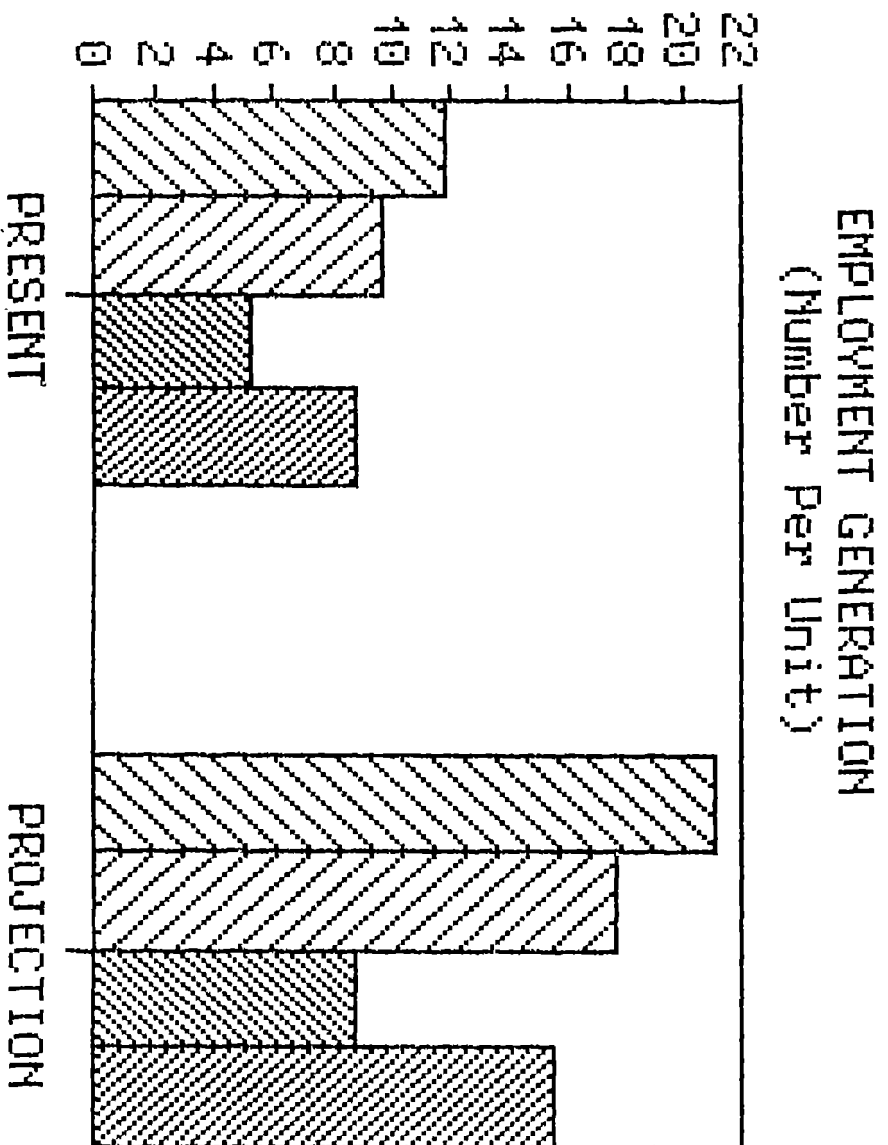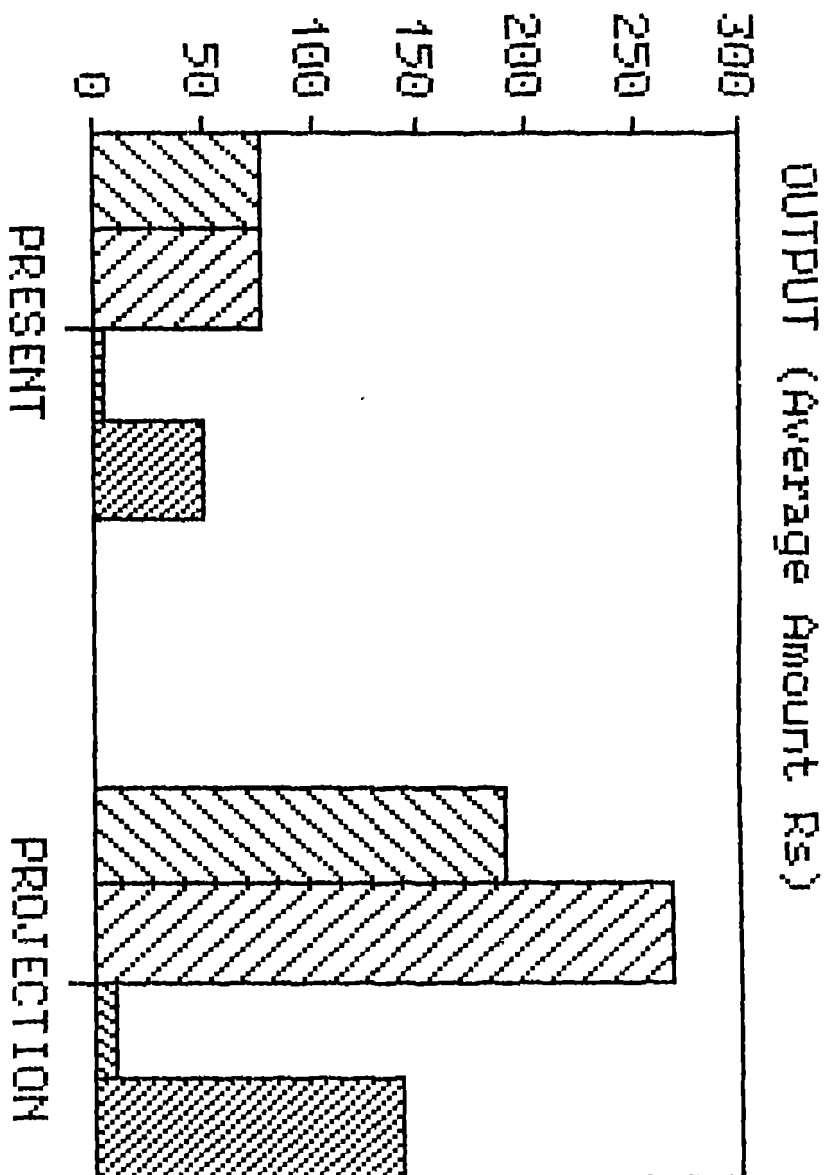
DELHI   GHAZIABAD   HYDERABAD   TOTAL

Table V.4 Frequency Distribution of Investment and Output in Micro Enterprise Sector

Frequency Range (Rs)	Delhi			Ghaziabad			Hyderabad			Total		
	A	B	C	A	B	C	A	B	C	A	B	C
1. Initial Investment												
a) Upto 25,000	17	3,900	229	12	1,950	163	75	2,853	38	104	8,703	84
b) 25,001-50,000	27	11,450	425	16	7,310	457	--	--	---	43	18,780	437
c) 50,001-75,000	12	8,550	712	13	8,550	658	--	--	--	25	17,100	684
d) 75,001-100,000	16	14,300	894	7	6,200	886	--	--	--	23	20,500	891
e) 100,000 +	3	4,750	1,583	2	3,700	1850	--	--	--	5	8,450	1690
TOTAL	75	42,950	573	50	27,710	554	75	2,853	38	200	73,533	368

94

Frequency Range (Rs)	Delhi			Ghaziabad			Hyderabad			Total		
	A	B	C	A	B	C	A	B	C	A	B	C
2. Present Investment												
a) Upto 25,000	--	--	--	--	--	--	75	683	91	75	683	91
b) 25,001-50,000	--	--	--	5	200	400	--	--	--	5	200	400
c) 50,001-75,000	3	225	750	2	130	650	--	--	--	5	355	710
d) 75,001-100,000	12	1185	988	16	1600	1000	--	--	--	28	2785	995
e) 100,000 +	60	11745	1957	27	5070	1878	--	--	--	87	16815	1933
Total	75	13155	1754	50	7000	1400	75	683	91	200	20838	1042

Frequency Range (Rs)	Delhi			Ghaziabad			Hyderabad			Total		
	A	B	C	A	B	C	A	B	C	A	B	C
3. Monthly output												
a) upto 25,000	2	50	250	5	109	218	75	339	45	82	498	61
b) 25,001-50,000	22	950	432	9	395	439	--	--	--	31	1345	434
c) 50,001-75,000	22	1470	668	17	1077	634	--	--	--	39	2547	653
d) 75,001-100,000	17	1590	935	11	1070	973	--	--	--	28	2660	950
e) 100,001 +	12	1725	1438	8	1275	1594	--	--	--	20	3000	1500
Total	75	5785	771	50	3926	785	75	339	45	200	10050	503

NOTES: A: Number of Units
B: Total amount in Rs. 000
C: Average amount per unit in Rs.00

d. Employment Generation

The micro enterprise sector makes a significant contribution to the employment generation capacity of the local economy. Some of the distinct advantages of this employment delivery system are :

i. Access to employment is an easy and flexible procedure without any prerequisites in terms of academic or technical qualification, experience or reference, which are features built into the entry system of labour market of formal sector enterprises.

ii. Skill upgradation is a continuous and in-house process and the career profile of the worker is linked to his skill upgradation capacity and adaptability for which the work environment provides ample opportunities.

iii. There is also an inherent potential for workers upgradation into entrepreneurship and thereby the multiplier effect on employment generation is likely to be higher than in the formal sector as the employee-turned entrepreneur will initiate another round of employment generation activity.

iv. Investment per unit of employment is a microscopic proportion of that in the formal sector enterprise.

The 200 SDS sample micro enterprises have generated 1782 units of employment, earning an average wage of Rs.770 per month. A very significant proportion of the employment, 45.7 per cent, is in the skilled category; in Delhi and Ghaziabad skilled jobs are 61.1 per cent and 57.3 per cent of total jobs generated by the sample units. Unskilled labour accounts for 54.3 per cent of the employment. A small proportion of the employment is generated among women (2.6 per cent) but only by the Delhi micro enterprises.

Table V.5   Pattern of Employment Generation by Micro Enterprises

Job Category	Delhi		Ghaziabad		Hyderabad		Total	
	1	2	1	2	1	2	1	2
1. Skilled Regular Male	309 (34.6)	1131	83 (17.1)	1308	–	–	392 (22.0)	1168
2. Skilled Casual Male	228 (25.5)	964	195 (40.2)	1012	–	–	423 (23.7)	986
3. Unskilled Regular Male	280 (31.4)	550	207 (42.7)	530	179 (44.3)	502	666 (37.4)	531
4. Unskilled Regular Female	16 (1.7)	544	–	–	–	–	16 (0.9)	544
5. Unskilled Casual Male	30 (3.4)	460	–	–	225 (55.7)	290	255 (14.3)	316
6. Unskilled Casual Female	30 (3.4)	415	–	–	–	–	30 (1.7)	415
7. Average Job Per Unit	11.9		9.7		5.4		8.9	
Total (1 to 6)	893 (100.0)	849	485 (100.0)	857	404 (100.0)	409	1782 (100.0)	770

Note   1.   Total jobs generated

2.   Average monthly wage rate in Rs.

3.   Figures in parentheses are percent of total.

On the average, the micro enterprise in the SDS sample generated 8.9 units of employment : 5.4 on a regular basis and 3.5 on casual and contractual basis (Table V.5). Regularity of the job is measured in terms of more or less continuous work in the unit over the preceding 2-3 years and does not connote any provision of minimum labour standards normally expected in regular formal sector employment. The terms and tenure of the job are laid entirely at the discretion of the entrepreneur. However, a strong relationship often develops between the entrepreneur and the 'regular' workers of a few years standing, to whom opportunity is available to become a partner or to set up an independent enterprise in the future.

The wage rate in micro enterprises is dependent upon the level of skill and nature of employment (casual or regular), the rate improving with the level of skill and regularity of the job. It is also interesting to find a higher wage rate for skilled workers in the micro enterprises in Ghaziabad as compared to those in Delhi, possibly because of supply constraints on skilled labour in the former (Table V.5).

The investment per unit of employment generated by the SDS sample micro enterprises is estimated at Rs.12,405 and is almost identical in Delhi and Ghaziabad (Rs.14,739 and Rs.14,433, respectively), but considerably lower in Hyderabad (Rs.2,167).

e. Projected Operations

On the basis of interaction with the sample micro enterprises, some data were generated by the SDS on projected operations of the units to assess the affordability to pay for civic services in the future and, in particular, to have

some idea of the likely improvement in the level of affordability, which is a material input for a policy decision on future public investment in the infrastructure sector. A 10-year projection has been attempted, using the 1990 perception of the entrepreneur on the situation likely to emerge in 2000 AD. Projections were made in terms of four parameters namely; investment, capacity, output and employment, and the results are presented in Table V.3.

Investment in the micro enterprise sector is estimated to increase at an annual rate of 12.0 per cent during 1990-2000, a considerably lower rate than attained during the initial 8-9 year period from inception to 1990, when investment increased at an average annual rate of 21.9 per cent. The projected annual rate of growth of investment in 1990-2000 is 17.4 per cent in Ghaziabad, 9.4 per cent in Delhi and 6.6 per cent in Hyderabad. The average investment per enterprise in Ghaziabad is likely to, therefore, exceed that in Delhi by the turn of the century, the respective levels likely to be Rs.3.83 lakh and Rs.3.40 lakh. This distinct improvement in the micro enterprise scenario in Ghaziabad over that in Delhi is also reflected in the antici- pated rate of growth of capacity, output and employment as well as in the level of capacity and output per unit. Employment per unit in 2000 AD is, however, expected to be higher in Delhi (21.1 jobs per unit as compared to 17.8 jobs per unit in Ghaziabad). The special efforts being made by the National Capital Region Planning Board in development of informal economic activities in Meerut and Ghaziabad and the proximity of Ghaziabad to Delhi, are two critical factors that will contribute to the growth of micro enterprises in Ghaziabad.

3. Water Consumption

    a. Accessibility to Infrastructure

    Data were generated on accessibility of micro enterprises

to five major infrastructural facilities as also institutional finance, normally available to enterprises in the formal sector. A major limitation of these data is that while they indicate whether or not a specific facility is available to the unit, they do not provide any insight into the adequacy or otherwise of the facility and the cost that is borne by the enterprise to avail of the facility. At best, these data, presented in Table V.6, can be taken as a broad indicator of availability of a specific facility and cannot reflect on its qualitative aspects.

Table V.6 : <u>Infrastructure Availability :Select Indicators</u>

		Delhi		Ghaziabad		Hyderabad		Total	
		No.	Percent	No.	Percent	No.	Percent	No.	Percent
1.	Water	75	100.0	50	100.0	75	100.0	200	100.0
2.	Power	75	100.0	50	100.0	46	61.3	171	85.5
3.	Telephone	9	12.0	9	18.0	1	1.3	19	9.5
4.	Sewerage	-	-	-	-	22	29.3	22	11.0
5.	Pucca approach road	22	29.3	1	2.0	43	57.3	66	33.0
6.	Institutional finance	13	17.3	7	14.0	4	5.3	24	12.0

Note : Percent is in terms of sample size.

The micro enterprises have good access to water and power, not necessarily through official government channels. All the sample units had access to water but about two-fifth of the units in Hyderabad did not have an access to power. Telephone facility is available to less than one-tenth of the micro enterprises, primarily in Delhi and Ghaziabad. Proper approach road has been developed to a considerable extent in Hyderabad, where almost three-fifth of the units had this facility; in

Delhi only about one-fourth of the units and in Ghaziabad only
2.0 per cent of the units had proper approach road. Sewerage
facility is non-existent in Delhi and Ghaziabad and is accessible
to 29.3 per cent of the units in Hyderabad. Some 12.0 per cent
of the sample enterprises could avail of institutional finance,
mainly from a cooperative or commercial bank (Table V.6).

   b. Water Consumption Pattern

   The total daily consumption of water by the 200 micro
enterprises in the SDS sample is estimated at 1.44 lakh litres.
As much as 88.8 per cent of the consumption is for commercial
or industrial purposes and 11.2 per cent for personal purposes
to meet the drinking and washing needs of the entrepreneur and
his employees. The per unit consumption is 638 litres per day
for commercial and industrial purposes and 80 litres per day for
personal purposes. There is a sharp variation in the consumption
pattern in the three sample cities : the average daily commercial
consumption per enterprise ranges from a low of 37 litres per
day in Hyderabad to 642 litres in Ghaziabad and to as much as
1237 litres in Delhi. In view of the fact that economic activity
is undertaken on a regular basis and climatic variations do not
have much impact on the size of the activity, the water consump-
tion is found to be almost uniform throughout the year, irres-
pective of the season. Thus, data for the SDS sample as a whole
show that the average daily water consumption by a micro
enterprise for commercial purposes ranges from 637 litres in
monsoon months to 638 litres in winter months and 640 litres in
summer months.   At the disaggregated level, there is no
variation in seasonal consumption in Ghaziabad, a negligible
variation of 2 litres in Delhi and a modest variation, 3 to 7
litres, in Hyderabad. This is in sharp contrast to the water
consumption pattern at the household level seen earlier in
Chapter IV and also, to some extent, reflected in the personal

Table V.7   Seasonal Pattern of Water Consumption in the Micro-Enterprise Sector

		Delhi		Ghaziabad		Hyderabad		Total	
		Total	Average	Total	Average	Total	Average	Total	Average
1.	Present Consumption								
a)	Personal								
i.	Summer	8280	110	7620	152	1969	26	17869	89
ii.	Winter	5980	79	6340	127	1651	22	13881	69
iii.	Monsoon	7625	102	7275	146	1413	19	16313	82
iv.	Total	7258	97	7074	142	1711	23	16044	80
b)	Commercial								
i.	Summer	92825	1238	32100	642	3098	41	128023	640
ii.	Winter	92725	1236	32100	642	2702	36	127527	638
iii.	Monsoon	92825	1238	32100	642	2364	32	127289	637
iv.	Total	92789	1237	32100	642	2766	37	127655	638

Note: Total covers all sample units and average relates to per unit.

level consumption of the entrepreneur and the workers in the micro enterprises, as can be seen in Table V.7.

The distinct variation in seasonal consumption pattern at the household level and stability at the micro enterprise level has to be kept in perspective in formulation of a water management and pricing policy for informal settlements. The constancy in the consumption pattern of micro enterprises suggests a strong possibility of developing a pricing policy which could have an in-built component of cross-subsidisation from micro enterprises to households within the settlement.

c. Water Delivery System

The magnitude of water consumption at the unit level is related to the type of activity undertaken by the unit, and this also determines the water delivery system developed by the enterprises. In the case of metal-based operations, water consumption is significantly higher than in activities based on use of plastics, glass, rubber, wax, mud, etc. Thus, for example, the steel rolling activities is Wazirpur in Delhi have a high water consumption, similar to the metal-related activities in Ghaziabad. The PVC cable operations in Vishwas Nagar, another Delhi slum cluster, need much less quantum of water, mainly to cool the melted PVC after it is rolled on to the brass or copper wire. Storage of water is necessary as supply has to be ensured at the time of operation. Water needs are lower in candle, bangle and ceramic units in Hyderabad.

The water delivery system that is developed by the micro enterprises is considerably determined by their product mix and sources of supply. In Hyderabad, the major source of supply is the Hussain Sagar Lake, supplemented by ponds in the vicinity of the units. The nominal requirement does not call for the development of large storage capacity. Thus, 97.3 per cent of the units in Hyderbabad depend on the lake and ponds. On the

other hand, 60.0 per cent of the units in Delhi, basically the
high water consuming units engaged in metal-based activities
in Wazirpur, have developed their own delivery system through
individual tube wells from where water is pumped out for
storage in especially built concrete reservoirs with capacity
ranging from 1000 to 4000 litres, from where water is drawn as
per the requirements. The Vishwas Nagar units in Delhi depend
primarily on piped water supplied by the local body and this is
stored in overhead tanks (generally of the Sintex type) with
limited.storage capacity. In the case of Ghaziabad, the local
body supplies piped water which meets the needs of 70.0 per
cent of the units and of the remaining some 24.0 per cent, units
engaged in metal-based activities, depend on tube wells (Tables V.,
V.8).

Table V.8 : <u>Sources of Water Supply to Informal</u>
<u>Micro Enterprises</u>

	Source	Delhi		Ghaziabad		Hyderabad		Total	
		No.	Percent	No.	Percent	No.	Percent	No.	Percent
1.	Tap piped water	16	21.3	35	70.0	2	2.7	53	26.5
2.	Handpump	14	18.7	3	6.0	–	–	17	8.5
3.	Tubewell	45	60.0	12	24.0	–	–	57	28.5
4.	Lake and pond	–	–	–	–	73	97.3	73	36.5
	TOTAL	75	100.0	50	100.0	75	100.0	200	100.0

The sources of water supply tapped by the micro enterprises
clearly suggest the lack of public facilities in Delhi and
Hyderabad. By and large the micro enterprises have made their
own arrangements for meeting their water requirements for
commercial and industrial purposes.

d. Monthly Expenditure

A recurring expenditure is incurred on maintenance of
the tube well, hand pump, storage facilities and transportation
of water from sources like lake and ponds. Very little of this
expenditure flows into the coffers of the local bodies, as their
role in the water supply delivery system is minimal. The
expenditure data, presented in Table V.9, seem to be under.
estimated, particularly because the expenditure on maintenance
of pumps and storage capacity is integrated with operational
expenses in the case of micro enterprises that have welding,
mechanical and electrical facilities.

Table V.9 : Average Monthly Expenditure on Water Delivery
System in Micro Enterprise Sector

		Present (Rs. per month)	Anticipated	Increase (Percent)
1.	Delhi	45	65	44.4
2.	Ghaziabad	54	56	3.7
3.	Hyderabad	15	22	31.8
	TOTAL	36	47	30.6

Discussions with the micro enterprises brought out a clear
inclination of the units to have an assured supply of water
through the normal supply system of the local bodies/development
authorities. The entrepreneurs are fully aware that the public
water delivery system may increase their financial liability.
They would nevertheless, opt to go in for a higher expenditure
on this account but be assured of regular supply of safe water.
This additional expenditure would be compensated by lower
disruption in their production activity due to water constraints

and also from the saving of expenditure on the labour input involved in the existing water delivery system as well as the additional cost on storage of water and maintenance of tube wells, hand pumps, etc.

e. Projected Consumption

On the basis of data generated by the SDS on future plans of the micro enterprises and interaction with the entrepreneurs, some estimates have been made on the projected consumption requirement of micro enterprises in 2000 AD. These are presented in Table V.10.

Table V.10   Present and Projected Water Consumption of Informal Micro Enterprises

(Litres per day)

		Delhi		Ghaziabad		Hyderabad		Total	
		Total	Average	Total	Average	Total	Average	Total	Average
1.	Personal								
a)	Present	7,258	97	7,074	142	1,711	23	16,044	80
b)	Future	10,865	145	10,225	204	3,001	40	24,091	120
2.	Commercial								
a)	Present	92,789	1,237	32,100	642	2,766	37	1,27,655	638
b)	Future	1,31,550	1,754	43,650	873	6,240	83	1,81,440	907
3.	Percent Growth								
a)	Personal	49.5		43.7		73.9		50.0	
b)	Commercial	41.8		36.0		124.3		42.2	

108

VI. CONCLUSIONS, POLICY RECOMMENDATIONS AND ACTION PLAN

1. Basic Issues

a. Perspective of Study

An important component of the UNCHS Global Shelter Strategy is the development of basic infrastructure and amenities for the habitat. Provision of drinking water, sewerage and sanitation forms a high priority input in shelter upgradation programmes. To quote the UNCHS Global Shelter Strategy document (P.46) :"Provision of water supply and sanitation services in adequate quantities will be a key input to the production and improvement of shelter." The significance of adequate potable water needs, particularly for low-income households in urban slums, was dramatically evident in the 1988 cholera epidemic in Delhi, and brought into focus, among other things, the low priority given by the Government to investment allocation for drinking water in urban areas. The Seventh Plan for instance, has provided a meagre 1.6 per cent of total outlay for the water and sanitation sectors.

A major constraint that arises when policy-makers,planners and other experts have to consider policies to extend services like drinking water and basic infrastructure to low-income households, who may reside/work in slum and squatter settlements, as well as to determine investment allocations, is the non-availability of reasonably authentic data and information on water needs and water consumption pattern, and also on issues like the capacity to pay for the services. Furthermore, as no provision exists for water supply for commercial and industrial uses in the informal sector settlements, valuable potable water gets diverted to such uses. An assessment of non-potable water needs of this segment of the population becomes crucial for formulating a viable water management policy. In this context, the suggestion of the National Commission on Urbanisation (NCU) to curb and minimise wastage in the water distribution system, including misuse, is extremely relevant. The draft National Housing Policy (NHP) also assigns high priority to improving the quality of life of the underprivileged group of society through an integrated human settlement upgradation, which

includes the supply of potable water.

It was in this perspective that the Ministry of Urban Development, Government of India requested the Society for Development Studies (SDS) to undertake an assessment of drinking water problems and needs of urban slum households in selected slums and review the official policy initiatives taken in this direction by the Government and public agencies. The Ministry desired the study to be done on the basis of case studies of selected slums in three cities, namely, Delhi Ghaziabad and Hyderabad.

b. Objectives

The major objectives of the study are :

i. To assess the needs of water for drinking, sanitation and other purposes by households in the informal settlements,

ii. To assess the needs of non-potable water for commercial and industrial use by economic units in the informal settlements,

iii. To study the type of households and economic units that reside/operate in the informal settlements, so as to assess their affordability to pay for water and related services,

iv. To develop a methodology to build a data bank that will provide inputs for monitoring and evaluating programmes and formulating sectoral development policies, and

v. To recommend policies to improve the supply of potable and non-potable water in the informal settlements.

c. Data Base and Methodology

Data and information on supply of drinking water to urban slums are not included in official data base as the slums invariably fall outside the purview of operations of the local public water supply system. Limited information is available in some cases on sources of supply of water to slums but mainly on the basis of observations, unsubstantiated by data. On many critical issues

relevant for formulating a drinking water strategy, even obser-
vation-based information is not available. These include the
average household water consumptionand needs, pattern of water
consumption, methods of payment for use of water, affordability
to pay for official supply of water, etc.

The SDS, therefore, generated primary data to assess the
water needs and recommend need-based water development and managemet
policies. As per the suggestion of the Public Health Engineering
Research Committee, Ministry of Urban Development, Government of
India, the following types of clusters were included in the
sample cities :

> a.   Jhuggi Jhopri Clusters (JJC), where little or no basic
>   services are provided by a public agency,
>
> b.   Unauthorised Colonies (UAC), where no basic services
>   are available, and
>
> c.   Resettlement Colonies (RSC), where some basic services
>   are provided.

The research methodology envisaged assessment of water
consumption and related issues on basis of case studies of sample
households and economic units in selected slum settlements. Discu-
ssions were held with local officials in slum department/housing
agency and residents in the city to identify the important slums
falling under category 'a', 'b' and 'c', following which the sample
slum locations were determined. As no census of such households
and units is available, listing of all households and economic units
in a pre-determined part of the slum constituted the census from
which a sample was selected to capture major economic activities
and categories of households in the slum clusters.

The SDS sample includes 1050 households and 200 economic
units : 400 households and 75 economic units each in Delhi and
Hyderabad and 250 households and 50 economic units in Ghaziabad.

2.   Main Findings

   a.   Socio-Economic Profile of Households

SDS studies in several parts of the country and covering different aspects of urban informal sector settlements and economic activities have brought out the necessity of socio-economic data to understand the genesis of the problems and appreciate the thinking of the concerned people. These data and their correct reading are basic inputs for formulating policies and schemes that are more likely to fit into the needs and absorbing capacity of the target group than the presently operating schemes, which are found to contain elements that suggest a significant mis-match between what the people want and what is provided by the public agencies.

In terms of household characteristics, the most significant determinant of the water needs and consumption of a subject household is its size, as total water consumption (not per capita consumption) is universally considered to be positively related to the number of members that constitute the household. The consumption pattern and quantum would, however, also be influenced by other parameters and some on which data can be generated through household surveys are the level of literacy, occupation and income (as indicated by that of the head of household), and age composition of the household. It is often felt that water consumption will be higher in households with larger number of children, who are prone to waste water, particularly in slum settlements, where for lack of other recreational outlets, playing with water when available and especially in the summer months, is believed to be a common pastime. Data on age of the head of household and its type together provide a quick insight into the composition of the household in terms of elders and children. Household type data indicate a priori, the water consumption pattern in the context of the understandably different needs of small nuclear households as compared to that of large joint households..

Social Profile

i.   Household size ranges between 5 and 6 members, it is
     on the higher side in Delhi and lower side in
     Hyderabad, with Ghaziabad being at mid-point.

ii. Majority of households are of nuclear type (87.1
     per cent).

iii. The earning member belongs to the most active working
     age group, 26 - 40 years (70 per cent of households).
     The proportions are considerably higher in Hyderabad
     (84.3 per cent) and comparatively low in Delhi (58.5
     per cent). This age structure is evident in all types
     of slum clusters.

iv. Illiterate and semi-literate households, as measured by
     the literacy level of the head of household, dominate
     the slum settlements, 80.6 per cent in JJC, 47.6 per
     cent in UAC and 46.5 per cent in RSC.

   The social profile data have significant policy implications.
The predominance of active working age group population suggests
scope for improvements in income generation capability and econo-
mic status. The low literacy level indicates direction for the
methodology for skill upgradation programmes (on-job, audio-visual
rather than written manual training modes) and nuclear family
characteristic of households brings out the need for developing
facilities like balwadi, anganwadi, creche, etc. to facilitate
women members to embark on some economic activity, as their work
participation rate is low.

Economic Parameters

i.   Economic profile data cast doubts on the conventional
     view that the slum residents are very poor, generally
     below the poverty line. The average household monthly
     income (AHMI) is Rs.885 and that of people working in
     the informal labour market and economic activities
     Rs.828, they account for more than 90.0 per cent of

the sample households. Incomes are considerably higher
in the UAC as compared to RSC and JJC. However, even
in the JCC, the AHMI is Rs.769.

ii. There is significant income variation among male and
female members:average monthly income of female head
of household is Rs.491 and of male head of household
Rs.769.

iii. The occupational profile suggests a pattern of irregula-
rity and uncertainty in income flows:46.0 per cent are
self-employed, 26.0 per cent daily wage workers and only
27.0 per cent regular wage workers (though the last
category includes people employed on casual, though not
necessarily on daily wage, basis.)

iv. However, income earning period data suggest a considerably
well-established scenario :about one-half of households
have been engaged in gainful employment for more than 10
years and another 29.0 per cent for 6 to 10 years. Only
1.0 per cent of household have an earning period of less
than 1 year. A regularity of income flow is clearly
evident, irrespective of the occupational pattern and
nature of job or activity. Discussions revealed disparity
in month-to-month income flows, mainly linked to seasonal
fluctuations but data on a 12-month period confirmed
regularity in income flows over the last 5 to 10 years.

v. Income trend data for the period 1987 to 1990, in fact,
suggest a clear improvement in economic status. The AHMI
has improved from Rs.717 in 1987 to Rs.792 in 1988, Rs.883
in 1989 and Rs.949 in 1990. The income data, thus,
suggest that it is erroneous to base an assessment of
economic status and affordability of slum households on
merely type of income-generating activity or an exclusive
income parameter like monthly income. A more appropriate
insight is possible only from a study of trend data on
income coupled with data on sources of income flows,
occupation pattern, period of income generation, house-
hold expenditure pattern, etc.

vi. The composition of household budget brings out the
predominance of expenditure on food, the proportion
on this item being inversely related to level of income.
One reason for the high expenditure on food is the
practice of slum dwellers to purchase basic food items
on daily and sometimes meal-to-meal basis, particularly
in the case of daily wage workers and also because of
problems of storage. Some other high expenditure items
are medical care, power and fuel, education and trans-
port.

vii. About two-fifth of sample households incur some
expenditure on water consumption, the average amount
being Rs.11.per month and ranging from Rs.7 in the JJC
of Ghaziabad to Rs.20 in the JJC of Hyderabad. In the
case of households who incur this expenditure, water
accounts for 0.6 per cent of their household budget.

viii. Household budget data suggest the areas in which public
intervention programmes can contribute to additional
savings from existing income. Thus, a flexible public
civil supply and health care delivery system can generate
savings on food and medicare accounts, apart from
contributing to improvement in the health level of the
population and consequently in improved productivity in
their economic activities.

ix. Projection on incomes for 1995 and 2000 A.D., as per the
perception of the household, indicates an improved eco-
nomic scenario in slum settlements: AHMI is projected
to increase by one-third between 1990 and 1995 (from
Rs.947 to Rs.1271) and further to Rs.1636 in 2000 A.D.
The projected decennial growth in income during the
period 1990 to 2000 is 72.8 per cent.

b. Water Consumption at Household Level

   The total water consumption of the 1050 sample households
   aggregates to 1.43 lakh litres per day (LPD), and the
   annual consumption is 522 lakh litres. An average house-
   hold with 5 members consumes 49,710 litres of water per
   annum, 136.2 LPD, and per capita consumption is 27.2 LPD
   considerably below the 40 LPD per capita norm fixed by
   the National Drinking Water Mission. The Mission's crite-
   ria relate to 'safe' drinking water whereas the SDS esti-
   mates also include water which might not qualify for
   inclusion in the Mission's terminology of safe water.

   The average water consumption per household is 100 LPD in
   Hyderabad, 137 litres in Ghaziabad and 173 litres in Delhi.
   The marked variation between cities is linked to the
   differences in sources of supply.

   The type of settlements has a critical impact on water
   consumption. The most irregular settlements (JJC) have
   the lowest water consumption of 116 LPD per household.
   The water consumption level improves with the quality of
   the settlement, averaging 147 LPD in UAC and 169 LPD in
   RSC.

ii. Basic needs like drinking, cooking and washing accounts
    for more than four-fifth of water consumption. Very
    little water consumption is directed towards sanitation
    which is borne out by the unhygienic environment in slum
    settlements, particularly in JJC.

iii. Community tap is the predominant source of water supply,
     followed by hand pump, also generally at community level.
     In fact, majority of the sample housing stock (57.0 per
     cent) obtain water from community level facility, gene-
     rally located within the cluster but sometimes also
     outside the cluster.

The flow of water is critically dependent on the hours
of supply. While hand pump is a round-the-clock source
of water, piped water, either on community or individual
unit basis, is restricted to a few hours in the morning
and/or in the evening. SDS estimates that the sample
clusters receive piped water, where available, on the
average for 6 hours a day in Delhi, 4 hours in Ghaziabad
and 3 hours in Hyderabad.

iv. The per capita consumption of drinking water is directly
affected by climatic variations :minimum in the monsoon
months, marginally higher in the winter months but in the
summer months the consumption spurts by more than 40.0
per cent. Average per capita consumption on an annual
basis is 3.3 LPD but only 2.6 LPD during the monsoon and
winter months and 4.4 LPD in summer months.

v. The water consumption of an adult male member for drinking
purpose is substantially higher than that of other members,
6.5 LPD as against 4.9 LPD by adult woman and 1.7 LPD by
child. In high consumption summer months, the adult male
consumption is 8.5 LPD, adult female consumption 6.4 LPD
and children consumption 2.3 LPD. These data are contrary
to the general feeling that children are a major source
of water waste in slum settlements.

vi. The water collection delivery system is almost wholly
dependent on the women members, supplemented by their
children's efforts. Women collect 76.1 per cent of the
household requirement of water and children 23.2 per cent,
the adult male's contribution is a mere 0.7 per cent.
This pattern is almost identical in the various types of
settlements like JJC, UAC and RSC.

The data on the water collection/delivery system bring
out the pivotal role of women's input. They not only
collect the water but also regulate its use and are found

to be the most effective conservation agent. The whole
system is built on her efforts, which absorbs 25-35 per
cent of the normal time, that can be otherwise used for
gainful employment. If one expects the socio-economic
profile of women in the urban informal settlements to
improve, her role in the water collection system will
need to be kept in perspective and attempt made to reduce
the labour input in the water collection system. At the
same time, a special role should be worked out for women
in any water conservation programme that may be formulated.

vii. While water consumption is recognised to be a direct
function of household size, composition, type of activity
engaged in, and seasonal factors, SDS data on water con-
sumption by households in different income groups within
the slum settlements bring out a clear impact of the level
of income on water consumption. There is a clear positive
relationship between water consumption and level of income:
at the macro-level for SDS sample households, average
water consumption per household is 111 LPD for the income
group up to Rs.500, 129 LPD for the income group Rs.501 -
Rs.1000, 185 LPD for the income group Rs.1001 - Rs.1500,
201 LPD for the income group Rs.1501 - Rs.2000 and 224 LPD
for the income group Rs.2000 - plus. The disparity in
water consumption between relatively higher income group
and others lower down in the economic ladder is evident
in all the three types of slum settlements. The economic
rationale for this disparity is that improvement in level
of income is accompanied by acquisition of more household
goods like clothes, and utensils and durables like water
cooler, cycle, scooter, etc. which make a demand on
water. Water storage capacity also improves with income
and the official audio-visual media to which the slum
population gets access with improvement in income, has
effectively succeeded in the campaign on promotion of
personal hygiene and cleanliness. This is reflected in
the desire to wash cereals and vegetables before cooking
as well as bathing and washing clothes more frequently.

viii. SDS has projected that average water consumption of
slum households is expected to increase by 65.0 per
cent over the next 5 to 10 years:from 137 LPD to
190 litres per capita.   The maximum increase is
expected in the JCC (78.4 per cent) but then too the
daily water consumption by JJC household will remain
less than that of slum households in UAC and RSC.
The projected consumption, as per the perceived needs
of the slum households, would remain considerably
below the norms of LPD per capita, fixed by the National
Drinking Water Mission (40 LPD) and 70 LPD per capita
recommended as "absolute minimum" by the NCU.

ix. The slum households incur considerable expense to
develop and maintain their water delivery system out-
side the jurisdiction of the public agencies. A common
scheme is installation of a hand pump jointly by 10 to
15 households at an investment of Rs.3,000 to Rs.4,000
but operational and maintenance expenditure is quite
steep, averaging Rs.150 to Rs.200 per month or roughly
Rs.15 to Rs.20 per household. These households are
keen to receive piped water through the local official
supply system because of its safety, regularity and
economy, in fact, hand pump water except through deep
boring, is not necessarily safe. It is estimated that
deep boring is required up to the extent of 75 feet in
South Delhi area, 60 feet in Trans-Yamuna area and more
than 100 feet in West Delhi area, which would demand
additional capital cost and further upset the economics
of the informal water supply delivery system. An illegal
connection, linked to the municipal water supply system,
involves a payment of Rs.15 to Rs.20 at monthly/regular
intervals.

c. Micro Enterprises and Water Consumption

i. An evaluation of water consumption status of micro
enterprises in slum settlements is critical for

formulating a viable water supply and delivery system
of public agencies because these enterprises form the
income-generating base in these settlements and can,
a priori, facilitate a pricing policy which could cross-
subsidise the water consumption at the household level.
The close interrelationship between micro enterprises
and informal households, often on an integrated shelter-
workplace basis, constitutes the pivot of a viable
water pricing policy.

ii. The SDS sample of 200 micro enterprises are predominantly
single-owner units (55.0 per cent) while the others are
partnership units under 2 to 4 partners. This brings out
the home-based nature of activity and also the close
integration of household and economic activities. Manu-
facturing is the main activity (93.0 per cent) with the
remaining engaged in assembling work. Metal fabrication
involving processing, assembling and manufacturing
accounts for 76.0 per cent of the sample units. These
characteristics of micro enterprises suggest the integra-
tion of shelter and workplace productive nature of acti-
vities involving high component of value-added related to
physical inputs in form of materials and operation in
activities that provide for skill upgradation and increasing
demand in an economy poised for economic growth.

iii. The micro enterprise entrepreneur in the SDS sample has
a profile that suggests strong probability of continuing
improvement in level-of affordability to pay for basic
services. The profile that emerges is of an entrepreneur
on an ascending path. He has had at least 15 to 20 years
work experience, has operated the present enterprise for
about 8-9 years and has reached a level of financial
standing that is indicative of a good capacity to pay.
The average age of the enterpreneur is 39 years and in
the individual survey cities it ranges from 36 to 41 years.

iv. The entrepreneur is basically a local man, as indicated
by his mother tongue, even though he may be a second or
third generation descendant of a migrant. There is a
high degree of stability in the shelter and workplace
location : 56.0 per cent of micro enterprise entrepre-
neurs in Delhi, 70.0 per cent in Ghaziabad and 99.0
per cent in Hyderabad have lived in the present slum
settlement since birth and 39.0 per cent in Delhi and
24.0 per cent in Ghaziabad have lived there for more
than 10 years. This type of entrepreneurs expressed
strong preference to continue and expand their activi-
ties at the present site. The 'permanent' nature of
the micro enterprise and the entrepreneur's residence
is a clear testimony to the inclination and desire to
contribute to the development of a congenial infrastru-
cture environment in the settlement and also the credi-
bility to obtain financial assistance from public
agencies, as there seems to be marginal possibility
of "disappearing from the scene" with the assistance
funds, an issue on which financial institutions have
often expressed grave concern.

v The literacy profile of the entrepreneurs suggests that
there is a fair possibility of absorption on their part
of training inputs designed for specific skill upgradation.
As at present less than one-tenth of the entrepreneurs
have received any formal business/technical training, one-
fifth have received no training, formal or informal,
and the majority (71.0 per cent) acquired skills through
hands-on experience. This profile brings out the high
level of skill absorption capability of the entrepreneur,
providing a base for an effective skill upgradation and
diversification programme as part of an integrated
income upgradation strategy for the slum settlements.

vi, .The total initial investment of the 200 SDS sample
micro enterprises is estimated at Rs.73.5 lakh, the
average initial investment per unit being Rs.36,700.
This investment has increased almost three times to
Rs.208.8 lakh over a period of 8 to 9 years. The
annual rate of growth in investment is 21.9 per cent
for the SDS sample and ranges from 16.4 per cent to
23.2 per cent in the individual survey cities.

The total monthly production of the 200 SDS sample
enterprises is estimated as Rs.1 crore against an
estimated installed capacity of Rs.68 lakh. The high
level of capacity utilisation is one of the efficiency
indicators of the micro enterprises sector. The sample
enterprises have generated 1782 units of employment,
with an average monthly wage rate of Rs.770. A signi-
ficant proportion of employment, 45.7 per cent, is in
the skilled category and the unskilled component has
adequate opportunities to develop required skills. On
the average, an SDS sample enterprise has generated
8.9 units of employment:5.4 on regular basis and 3.5
on casual and contractual basis. While the terms and
tenure of jobs are laid entirely at the discretion of
the entrepreneur, a distinguishing feature of the
informal labour market is the bond of friendship and
continuity that develops gradually between the employer
and employee, to whom opportunities are made available
to become a partner or to set up an independent enter-
prise in the future.

Investment per unit of employment is estimated at
Rs.12,405 at the macro level for the micro enterprises
sector represented in the SDS sample and is almost
identical in Delhi and Ghaziabad (Rs.14,739 and Rs.14,433)
and very modest in Hyderabad (Rs.2,167).

vii   The projected scenario of the micro enterprises sector
       seems to be bright. On the basis of current perception
       of the entrepreneur of his own projection for 2000 AD,
       the projected scenario is :

       a. Investment is expected to increase at an annual rate
           of 12.0 per cent during 1990-2000, considerably
           lower than in the initial 8-9 years since inception
           to 1990 (21.9 per cent). Average investment per
           enterprise in Ghaziabad in 2000 AD is likely to
           exceed that in Delhi because of the inputs expected
           from the development strategy of the National Capital
           Region Planning Board.

       b. The production capacity is expected to increase at
           an annual rate of 13.7 per cent, while actual
           production is expected to increase at an annual rate
           of 18.3 per cent. Employment is expected to increase
           at an annual rate of 17.6 per cent. Average number
           of jobs per unit is likely to be 15.7 in 2000 AD as
           compared to 8.9 jobs per unit in 1990.

viii. The micro enterprises have good access to water and
       power, not necessarily through Government or official
       channel. The total daily water consumption by 2001 AD
       is estimated at 1.44 lakh litres, 89.0 per cent for
       commercial and industrial purposes and 11.0 per cent
       for personal use of the entrepreneur and employees.
       Average unit consumption is 638 LPD for commercial and
       industrial purposes and 80 LPD for personal purposes.
       There is a sharp variation in the consumption pattern
       in the individual cities, linked to the type of economic
       activity undertaken by the enterprises. However, in
       view of the regular nature of the activity, water con-
       sumption does not change materially with respect to
       climatic changes, as in the case of water consumption at
       the household level. The major determinants of water
       consumption at the enterprise level are the nature of
       the economic activity and the changes in demand for

the products of the enterprise. The relative stability
of water consumption at the enterprise level suggests a
strong possibility of developing of pricing policy
which could have an in-built component of cross-subsi-
disation for micro enterprises to households within the
settlement.

ix. The type of economic activity not only determines the
quantum of water consumption at the unit level but also
the water delivery and storage system developed by the
enterprise. The high water consumption activities in
the metal-based operations have developed a system wherein
water has to be stored for use on a continuous basis.
Thus, 60.0 per cent of micro enterprises in Delhi, who
are in this category of activity, have developed their own
delivery system through individual tubewell from where
water is pumped out for storage, in especially built con-
crete reservoirs, with capacity ranging from 1000 to
4000 litres, from where water is drawn as per the require-
ment. Where piped water is available, supplied by the
local body, storage capacity, generally of the sintex type,
is developed and that capacity depends on the anticipa-
ted water requirements. The availability of public
facilities is marginal in the case of informal enterprises
in Delhi and Hyderabad but in Ghaziabad 70.0 per cent
of the units received piped water from the local body.

The direct delivery system developed and maintained by
the micro enterprises to meet the water needs, neverthe-
less, requires initial capital investment on installation
of tubewell, hand pump and storage facilities and main-
tenance expenditure on these assets and equipments as
well as on collection and transportation of water, parti-
cularly from sources like lakes and ponds. SDS data
estimates on the basis of interaction with the micro
enterprises, that on the average an enterprise spends
Rs.36 per month on maintaining the water delivery system
and the city-level estimates are Rs.15 for Hyderabad,

Rs.45 for Delhi and Rs.54 for Ghaziabad. These enter-
prises anticipate an increase in the monthly expenditure
on water by 31.0 per cent over the next 10 years. How-
ever, these estimates are on the lower side because the
maintenance expenditure on pump and storage capacity is
closely integrated with the operational expenditure in
the case of enterprise that has welding, mechanical and
electrical facility, which are not included in the
estimates. It would be more realistic to assume that
the micro enterprises are spending about Rs.60 - Rs.70
per month for meeting their water needs, estimated at
720 LPD on the average.

x. The micro enterprises are keen to participate in the
water delivery system with the local body and develop-
mental authorities and expressed a clear preference to
pay even more than what they are presently spending to
local bodies in return for assured supply of water. Their
rationale for enhanced payment to the local body is the
saving on expenditure on labour inputs involved in the
existing water delivery system, additional cost of
storage and maintenance of the equipments and also
disruption in the unit's activities at present linked
to problems in supply of water.

3. Policy Recommendations

a. The Issues

In the perspective of the national resource constraint
and in particular, at the level of development authorities
and local bodies, it is not-feasible to supply treated
piped water to all slum settlements within a short time
frame. It is also not economical and in fact may not be
essential, in view of the variegated end-uses, linked to
the composition of residential and micro enterprise units
in the slum settlements.

Another crucial issue is the need to effect a balance
between cost recovery and population coverage in water and
sanitation programmes. It is now accepted that in the case
of the urban poor in slum settlements, one cannot envisage
a programme calling for immediate recovery of full cost but
at the same time the needs of the lower percentiles of the
population cannot be overlooked on this account from social
and political considerations. A careful mix of population
coverage and cost recovery is essential, which implies a
judicious blend of social, political and economic inputs
for developing a realistic water supply development and
pricing policy. This study has shown that the perception
of policy makers that the urban poor cannot pay for services
like water is not wholly realistic, as their present record
of payments is far more creditable than that of people
in the higher income percentiles. While a significant part
of the payments might be made by the urban poor under stress
or out of the sheer need for a basic necessity, this study
has documented that the urban poor have a definite capabili-
ty to make some payment on a voluntary basis.

In this context, the official admission of national
governments and international organisations on the failure
to achieve the coverage targets of the International Drinking
Water Supply and Sanitation Decade (1981-90) is significant.[2]
While one possible reason for the failure to attain the
targets is the unrealistic base for formulating the targets
and fund allocations due to lack of appropriate data base,
the SDS feels that an important operational factor is the
general attitude of governments to cover in their urban basic
service programmes the population normally covered in city
master plans, which in effect overlooked the needs of the
slum population. At times, national and local government may

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2. See for example, the reports of the Manila Regional
   Consultations sponsored by Asian Development Bank(June 1990)
   and the Delhi Global Consultations sponsored by the UNDP
   September, 1990).

provide some input for urban services to slum settlements,
but largely on ad hoc basis, often at the initiative of a
few dedicated officials. No institutional mechanism has
been developed for this purpose. A development strategy
will have to keep this in perspective.

The Asia and Pacific Regional Consultation on 'Water
Supply and Sanitation - Beyond the Decade' sponsored by
the Asian Development Bank (Manila, June 4-8, 1990)
recommended (p.5) : "To provide a framework for increased
water supply and sanitation (WSS) investments, each country
needs to have a comprehensive sector development strategy
setting out the overall objectives, priorities to be
afforded to urban and rural areas and the balance between
the water and sanitation subsectors. It should include
identification of the responsibilities of all agencies active
in the sector, and the role to be played by central and
local government, private sector and non-governmental organi-
sations, and benefiting communities. Clear definition is
needed of the government's commitment to sector development,
the resources to be allocated to it, policies for cost recovery,
tariffs and subsidies, and the manner in which WSS sector
planning is to be integrated with plans for urban and rural
development, land use, water resources management and environ-
mental protection." This statement brings out clearly the
desired work programme for an effective partnership of all
sectors in the water delivery system as also the priority
policy issues concerning investment, pricing, subsidies and
cost recovery.

The policy recommendations in this study are made in the
perspective of the above-mentioned issues. In terms of the
objectives specified for this study by the Ministry of Urban
Development, Government of India, the recommendations cover
specific areas that may facilitate the flow of financial and
technical resources for strengthening the delivery system for
water and related services, support the programmes of the
lower percentiles of the population to gradually upgrade their

affordability and capacity to pay for urban services on full
cost basis and develop a monitoring and evaluation system that
will provide a base for further· development initiatives and
programmes in the sector.

b.   Recommendations

1.   The integrated nature of urban settlements, covering
      housing as well as economic activities, provides a good
opportunity to devise a dual system of water delivery linked
to end-use. This will facilitate the evolution of a cost-
efficient solution. The capital outlay and operational
expenses on water treatment to meet the non-potable water
needs will be eliminated and potable water may be provided
basically for drinking and cooking. A regularity mechanism
has to be developed for this purpose, based primarily on the
efforts of the community itself and NGOs. A special role
will have to be incorporated for women in this regularity
mechanism as they have clearly demonstrated a better aware-
ness of the need to conserve water than the male members of
the household.

2.   The integrated nature of the slum settlements provides
      an appropriate base to have a dual pricing system for
purpose of cross-subsidisation within the slum settlement.
Two possible parameters may be considered for this purpose:
the amount of consumption (a lower rate up to a certain
monthly consumption level, based on some desired per capita
consumption norm) and end-use (lower rate for domestic
vis-a-vis commercial consumption). A mix of the two parame-
ters is also a feasible proposition.

3.   The basic aim of a water delivery system should be to
      provide piped water for basic household needs like
      drinking, cooking and washing and hand-pump water to
meet other needs. At the micro enterprise level, the delivery

system may provide piped water upto a specific quantum and
the units may be facilitated to instal hand-punps, if their
water needs are much more. This would promote a healthy
Government-private enterprise partnership. Soft-term credit
may be provided for installation of hand-pumps.

4. A self-help, participatory community effort, which is
    a well-accepted concept in shelter development, must be
extended to strengthen the water delivery system. The piped
water programme of public agencies and the government must be
supplemented with private community-owned and managed pro-
gramme of shallow wells, hand-pumps and tube wells. To
promote these activities at both the household and community
levels, soft-term credit must be provided for development of
the facility and a community-level budget earmarked to meet
the necessary maintenance and operational expense. At the
level of the micro enterprise, the facilitating role of the
public agency may be directed towards provision of finance
on soft terms for the development of the facility and special
incentives for utilisation of such a type of delivery system
in preference to dependence on the system of piped water
provided by the public agency.

5. While government agencies have, through schemes like the
    minimum needs and urban basic services programmes, tried
to reach people in the lowest rung of the development ladder,
the desirability of location-specific intermediation of NGOs
is now well accepted to facilitate and strengthen the flow
of urban services. The participation of NGOs in the community
development programmes should not be confined to management
of a particular urban service, but should extend to project
planning, designing and implementation. A co-ordinated
programme which promotes an effective partnership of all
actors, the developers as well as the end-users of the water
delivery system, is critical to any programme that seeks to
meet the felt-needs of the people through an efficient economic

package. In the case of the urban poor, what is more important and practical is not "mass production" of a basic service (which might be cost-prohibitive in relation to the affordability) but rather the production of the basic services "by the masses".

6.   The women's role in the water delivery system in urban slums needs due recognition. It is now well documented in several developing countries, as also substantiated in this study, that women are the main procurers and conservers of water but in the process of building up a water delivery system, there are several negative fall-out effects on her well-being. The role of water collection. thrust on the women by the social and cultural environment.exposes her to grave risks, including serious injuries from falls, disfigurement, complications during pregnancy and continuous fatigue, apart from severely limiting her capacity to participate in income generation, skill development, literacy and other self-upgradation programmes, which might be available for the community.

Bearing the day-to-day responsibility of water collection, women have developed as a major conservation agent in the water sector. A management role in both the water delivery system operated by the public agencies as well as the informal water delivery system, developed :through community participation, should be entrusted to the women of the community. The women can also play a distinct role in conservation of water and provide the local level input that is now missing in the water delivery system where there is enormous water wastage due to poor negligible maintenance of community water outlets such as fountains, taps hydrants, etc. Women can be entrusted with the responsibility of bringing about the desired awareness in the community for water conservation on a continuing basis:in fact, they could be the leaders of the community level "watch" group and volunteer corps. In recognition of their services, the public agency should provide suitable financial remuneration to the women.

7. A community based water delivery system, with a pivotal
    role for women, will stimulate the community upgradation
in its totality, covering social, cultural and economic deve-
lopment. It will be an effective way of implementation of a
bottom-up strategy within the slum settlement, as the women
is definitely at the lowest rung of the ladder and will have
an opportunity for status elevation in the society. Apart
from management of the community hand-pump and related infra-
structure, women should be given the responsibility to main-
tain the hand-pump through appropriate technical training.

8. An appreciable duration of women's work time is expected
    to be released from the water delivery system. Attempts
need to be made by public welfare agencies and NGOs to ensure
that this time is channelled into skill upgradation and
related income generating activities. This would contribute
significantly to improving the affordability of the household
in absorbing water and other services that would be developed
through the active partnership of the government,public
agencies, community and the NGOs.

9. International organisations can, and will continue to,
    provide credit and technical assistance for development
of the water supply delivery system but a long-term strategy
should be primarily based on national and local resources
from plan outlays, government budgets, national capital
market, the household sector, as well as the beneficiaries
of the programmes. A national level resource mobilisation
strategy will have to be carefully drawn up. A long-term
five-point strategy is proposed:

  a. The water and sanitation sector will have to demon-
      strate to the Planning Commission for a larger Plan
      outlay by establishing and documenting a close lin-
      kage between investment in water schemes, the health
      of the community, improvement in productivity and
      economic activity. Thus, for example, it would be

desirable to estimate the man-hours lost in water
collection as the same can be productively utilised
in income generating activities. In this context,
the policy-makers concerned with additional financial
flows in the water sector will have to estimate the
loss in GNP due to inadequate provision of water in
urban areas. It would be equally useful to assess
the total investment in the informal water delivery
system, both of capital and operational nature (inclu-
ding the non-monetised component) and the cost of such
investment to the community.

b. The second important source of domestic financial
    flows is the institutional financial system, comprising
    the insurance sector, commercial banks, industrial
    development banks and, more recently, specialised
    housing and infrastructure financing institutions.
    The agencies concerned with promotion of investment
    for the water sector will have to make a strong case
    with industrial finance institutions to formulate a
    norm for investment in water and sanitation infrastru-
    cture in every major industrial project particularly
    in the new locations. The insurance sector will have
    to be motivated to incorporate a loan scheme for water
    supply and sanitation in each major housing sector
    loan programme to be undertaken by public as well as
    private developers.

    There is a high priority need to establish a specia-
    lised urban water supply and infrastructure finace
    corporation. This is a Seventh Plan programme for
    which the Ministry of Urban Development, Government
    of India, had appointed a High-level Committee under
    the Chairmanship of the Union Urban Development
    Secretary. This Committe did some basic work to
    assess the feasibility of the proposed institution

and its fundings but did not submit its Report
because of an <u>ad hoc</u> decision to not establish any
new urban sector financial institution (apart from
the National Housing Bank) in the Seventh Plan due
to resource constraint and, to alternatively esta-
blish an urban infrastructure finance wing in the
HUDCO. This <u>ad hoc</u> policy of financing urban
infrastructure must be replaced by a systematic
financial system through the setting up of a specia-
·lised urban infrastructure finance and development
institution, also proposed recently by the National
Commission on Urbanisation.

There is a point of view that the Seventh Plan scheme
for a specialised urban infrastructure financial
institution failed to take off the ground because for
almost two to three years during the Plan period, no
special initiative was taken by the Government to
establish it, whereas work on setting up the National
Housing Bank was taken up in real earnest from the
beginning of the Seventh Plan. A specialised infra-
structural finance institution will facilitate the
mobilisation of household and institutional finance
through the Indian capital market as well as the
international financial markets. An alternative to
a new institution may be the development of HUDCO as
a specialised urban infrastructure and area finance
institution by withdrawing its activities from urban
and rural housing, for which the National Housing
Bank network is now available.

c. It is well recognised that the financial flows from
    the domestic capital market will be accessible only
    if the on-going rate of return can be assured for such
    funds; hence low-cost funds cannot be ordinarily
    available from this source. However, through an
    appropriate fiscal mechanism, it would be possible to

raise the effective rate of return on such funds so that
the cost at the first stage, at the level of the develop-
ment agency which needs the funds, could be correspondingly
reduced. This strategy has already been deployed to faci-
litate financial flows into other sectors like industry,
agriculture, export and more recently housing and it is
strongly recommended that the mechanism be extended to
the water supply and sanitation sector.

d.   The private sector should be encouraged to participate
in the financial flows for water and sanitation sector,
provided their participation leads to net additionality
of financial resources from outside the public financial
institutions and other agencies that could be tapped even
without their involvement in this sector. It will be nece-
ssary to ensure adequate return to the private sector
investment. Fiscal incentives at an accelerated rate
might be provided to stimulate private sector investment
on the same lines as provided to stimulate investment in
priority areas like R & D, exports, backward area develop-
ment, etc. In fact, shelter and water supply programmes
require a high-level thrust and participation of private
initiatives and investments, for promoting which fiscal
stimulants seem to be very appropriate. A beginning has
already been made in the shelter sector and needs to be
extended to the water supply sector.

e.   As a long-term policy, the provision of basic urban servi-
ces like water will have to be priced on a full-cost
recovery basis so that the programme can be sustainable
on a continuing basis through the resources of the commu-
nity itself. In economic terminology, a process should be
built-into the programme that will facilitate immediate
access to a basic urban service even to the lowest income
percentiles of the population, living and working in slum
settlements and contribute to gradual elimination of
subsidy in the tariff structure so that, over time, a

full-cost recovery status can be attained. This programme towards full-cost recovery has to be properly phased on realistic assessment of slum settlement-specific realities and projections on future needs and economic status, with well-identified inputs of facilitating support to be provided by the government and public agencies.

A pricing policy can be formulated wherein the tariff structure for the urban poor in the initial period may recover 50 per cent to 60 per cent of the actual cost of the services and the proportion of cost recovery may be gradually raised to full-cost recovery over a period of 7 to 10 years. The government, as a facilitator and in partnership with community leadership and NGOs, could contribute to upgrading the income generating capability of the urban poor through appropriate skill development, market intelligence and other support packages. A cost recovery strategy may, thus be phased over a 7-to-10 year period.

The full-cost recovery strategy for the micro enterprises in the informal sector may have a shorter time schedule say, 3 to 5 years. Micro enterprises, may be provided with water and related services at less than full-cost recovery tariff for the initial 2-to-3 year period and the rate structure may be modified to reach a full-cost recovery level at the end of 5 years of operation. It might be advisable, however, to have a dual pricing policy linked to the amount of consumption so that the smaller of the micro enterprises are cross-subsidised by the relatively big brothers.

10. A long-term water supply development policy will require the formulation of appropriate water consumption norms. These norms will have to be developed on the basis of grass-root

level data and information that take into account geographical, social and cultural characteristics, which seems to have a bearing on the pattern of water consumption. It would be desirable to develop location-specific norms at four levels of disaggregation, namely:

    a. norm for drinking and cooking (potable water),

    b. norm for washing and personal hygiene,

    c. norm for economic activities linked to shelter unit,&

    d. norm for other miscellaneous uses.

The development of norms will require regional level water needs assessment and primary data on existing water consumption pattern, projections on future growth of population, shelter and economic units and level of income. The norms will form the basic input to assess the investment requirements of the water and sanitation sector and, thereafter, to develop a resource mobilisation policy covering financial, technical, human and other resources required to develop and strengthen the water delivery system.

11. To facilitate the development of the water delivery system, it is of utmost importance to integrate water supply programmes with city, town and regional development plans and shelter up-gradation and economic activity development project. This is of particular significance to urban informal settlements.

12. The study has clearly demonstrated the usefulness of primary data to provide an appropriate insight into the water consumption realities at the grassroot level and also to assess the actual situation of the communty and micro enterprises to pay for water and urban services. The data generated in the study, however, cannot provide an adequate base for formulating national-level or even state-level water delivery and pricing policies for urban slum settlements. It will be desirable to extend the scope of the data base developed in this study to cover another 15 - 20 cities and towns in different parts of the country for building a base that is appropriately large and representative for the purpose of formulating a

national policy. The extended data base will thus have to
represent the ground-level situation in different geographi-
cal regions covering hill areas, drought-prone areas, cyclone-
shadow areas, underdeveloped areas, etc. as well as different
social, cultural and economic environments.

A good data base, as proposed in this study, will facilitate
the development of an adequate monitoring programme since it
will provide bench mark data, on the basis of which further
evaluation work can be structured. A continuous monitoring
and evaluation of water consumption needs, investment flows,
investment needs and changing income status and affordability
is a basic prerequisite for implementing the long-term strategy
of phasing out subsidy in the schemes for provision of urban
basic services and attaining the goal of full-cost recovery in
the pricing of these services.

13. The successful development of a water delivery system that
would cater to the needs of urban slum settlements will depend,
to a considerable extent, on the appropriate perception, approach
and work ethos of the officials of the public agencies involved
in the development activities. Since the urban informal
settlement require an approach which is markedly different
from an approach evident in urban sector projects for the
formal settlements, it is crucial to bring about an attitudinal
and contextual change in the work programme of the officials.
A HRD programme that is based on an assessment of training
needs of these officials must be specially structured in short-
term modules to equip the officials to assess more appropriately
water consumption needs, socio-economic profile and future
programmes of the community and then translate these assessed
needs into group-specific programmes and schemes. It would
be highly desirable to integrate the development of water supply
and sanitation programmes into the shelter development and
upgradation programmes which are generally implemented by local
level public agencies and, in many cases, with active partici-
pation of the community and the local NGOs. The HRD programme
should facilitate the officials to take up an integrated human

settlement programme, which would include economic upgra-
dation also, rather than isolated single-component programmes
covering one of the several components that constitute human
settlement development such as, land, core shelter, water,
sanitation, economic activities, etc.

.4. Action Plan

A 9-point action plan is proposed for implementation of the
major recommendations of this study. The plan is basically
focussed on the flow of additional financial, technical and
human resources that are required to develop and strengthen
a mix of initiatives of public agencies, the private sector
and the community to develop the water supply delivery
system. The action plan covers, in particular, the creation
of an environment in which the critical catalytic input,
finance, will be able to flow into the water and sanitation
sector on a continuing basis.

a.   Delivery System

A comprehensive delivery system should be an immediate
goal so that a network is built up in a cost-efficient manner
with the participation of the community (in particular, women),
NGOs and the private sector, who can jointly supplement, but
not replace, the efforts of the government and public agencies.
This programme should be taken up immediately and a time-
schedule set up to develop community-level participation in
all urban slum settlements during the first two years of the
Eighth Plan, namely, during the period April 1991 to March
1993. The induction of private capital and enterprise should
be also initiated during his period.

The Ministry should promote and develop the role of women
in water conservation and related activities. The Ministry
should allocate a budget to compensate the work efforts of
women in the water delivery system and also reduce her oppor-
tunity costs to her household. The budget allocation should
be made immediately through reallocation of some heads of

plan and non-plan expenditure for urban sector projects in
1991-92 and through direct allocations thereafter.

b.   Fiscal & Financial Environment

        An appropriate fiscal and financial environment must
be created to facilitate the flow of investment from the private
sector. The direct tax system covering both personal and
corporate income tax is a convenient instrument to provide
an accelerated rate of depreciation and investment-related
allowances to stimulate private sector investment in water
supply and sanitation projects. An additional incentive may
be provided if these investments cater to the needs of the
urban slum settlements. The possibility of the private sector
being allowed to levy and collect some type of user charge
for the first 5 - 10 years of the project might be explored
on lines of similar incentive provided to the private sector
in several developing countries to invest in the road and
bridge network. The responsibility for maintenance of the
water delivery system would in such a case, be vested with
the private sector.

It would be desirable to reduce the investment outlay of the
private sector in the development of the water supply delivery
system by exempting the project from payment of excise duty,
sales tax, octroi and other such levies imposed by the Central,
State and Local governments on purchases of capital and other
equipments that are required for the project. This facility
may be restricted to projects that serve the needs of the slum
settlements.

The participation of the community and NGOs   in developing
and maintaining the water delivery system should be facilitated
through access to institutional loan on soft terms and the
Government should allocate a budget to meet the maintenance
expenditure.

The development of the appropriate fiscal and financial
environment, which would facilitate additional financial
and entrepreneurial resources into the water and sanitation
sector must be taken up on a priority basis, within the
first 2 years of the Eighth Plan. It is essential to incor-
porate the fiscal incentives in the Finance Act at the
earliest opportunity. A study on the relevant fiscal
incentives required for this purpose may be sponsored by
the Ministry to provide a base for its negotiations with the
Union Ministry of Finance.

In order to facilitate the Planning Commission to provide a
larger plan outlay for the water and sanitation sector, it
is essential to initiate a series of studies covering different
parts of the country to generate primary data on the type of
issues covered in this study as well as on the relationship
between investment in water schemes, the health of the commu-
nity, improvement in productivity and economic activity. It
is essential to demonstrate to the Planning Commission, the
Ministry of Finance and financial agencies responsible for
sectoral allocations that the investment in the water and
sanitation sector will help to reduce investment in sectors
like health as well as develop the potential of the community
to generate jobs and self-sustaining economic activities which
will contribute to the GNP, national savings, etc. While
there is a general awareness of many of these issues, it is
desirable to provide some estimates. The Ministry may spon-
sor such studies during 1991-92 so that they are available
for developing appropriate policy initiatives at the time of
the Mid-Term Appraisal of the Eighth Plan.

The Ministry should initiate work to establish an urban
infrastructure finance institution at an early date or alter-
natively would consider to upgrade the activities of the
HUDCO as a specialised infrastructure and area finance and
development institution. An assessment of HUDCO's capabi-
lity for this task will be required.

c.   Pricing Policy

A strategy to attain a pricing policy on full cost
recovery basis must be taken up immediately in a phased
programme of cost recovery linked to proper assessment of
the improvement in the cost absorbing capacity of the
community. A full cost recovery goal should be targetted
over a period of 7 to 10 years for urban informal sector
settlements and 4 to 5 years for the micro enterprises in
the urban informal settlements.

d.   Skill Upgradation

A skill upgradation programme should be immediately
developed and implemented in slum settlements to meet two
basic goals, namely, capacity to repair and maintain the
water delivery network within the settlements and to
expand and diversify the economic activity base of the
community. These two types of skill inputs will reduce the
operational and maintenance cost of the water delivery system
and raise the income level of the community, which would
jointly contribute to upgrading the affordability of the
community to absorb basic urban services with the minimum
component of subsidy. In view of the urgency of attaining
the objectives to be met by this component of the action plan
it is essential to initiate work within the first year of the
Eighth Plan and seek to cover all urban informal settlements
during the Eighth Plan period.

The Government and public agencies as facilitators, should
provide necessary financial support to NGOs and community-
level organisations to assess areas of skill development and
diversification, formulate training modules and provide access
to inputs, market intelligence and other development support
which would facilitate the community to initiate and continue
an economic upgradation programme.   It is not essential to
subsidise the financial input to a considerable extent but
rather develop flexibility in credit appraisal, disbursement
and recovery policies. In this context, the proposal of the

National Commission on Urbanisation to set up a micro business
bank should be implemented on priority basis. The Society
for Development Studies is expected to submit a Feasibility
Report on this proposed financial institution to the Ministry
of Urban Development, Government of India soon and the
Ministry may initiate work to implement the NCU recommenda-
tion so that the affordability level of the urban poor could
be upgraded effectively.

In order to evoke a positive response of the bureaucracy
and public agencies to the special needs of the urban poor
concerning water and sanitation, there is a need to develop
special short-term training modules on Management of Urban
Informal Sector, with particular emphasis on water and sani-
tation issues. The officials need to be exposed to the
techniques of need assessment of the community and translating
these assessed needs into appropriate schemes and programmes.
The Ministry may identify a suitable training institution
which specialises in these training activities to undertake
this task on a priority basis. Their capability to monitor
and evaluate the schemes also has to be strengthened.

e.   Monitoring, Evaluation & Data Bank

A monitoring and evaluation system will have to be
developed within the Ministry or in some independent research
institution that has the expertise to perform these functions,
so that the Ministry is able to assess periodically the impact
of sectoral investment on the life style of the people and
also assess accurately the future water needs and investment
requirements. The present study provides a format which,
with suitable modifications, might be adopted for work in
other parts of the country. It is proposed that in 1991-92,
such work may be initiated in 12 to 15 small and medium towns
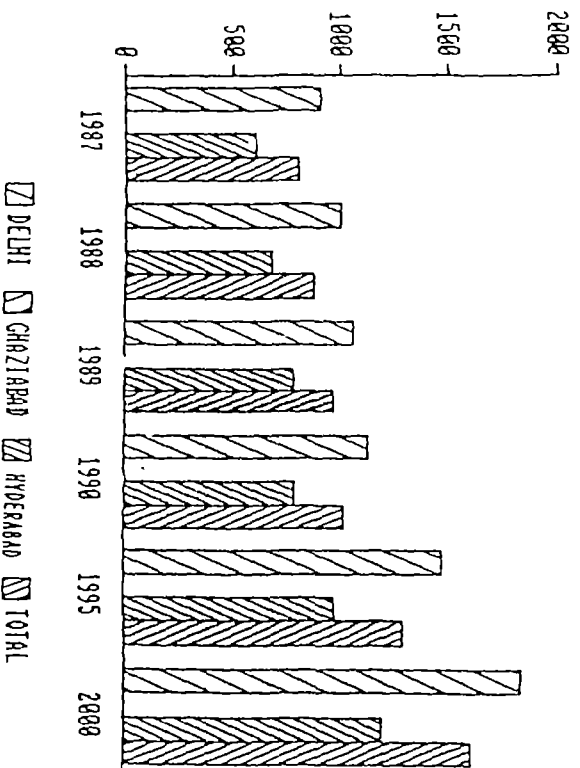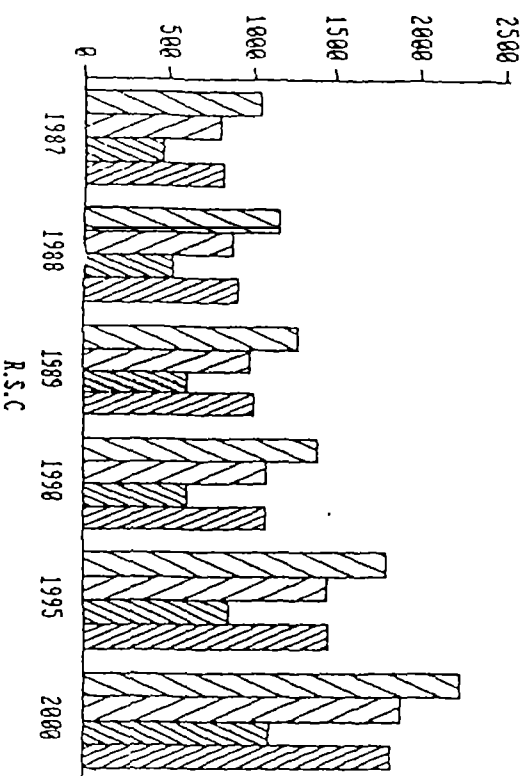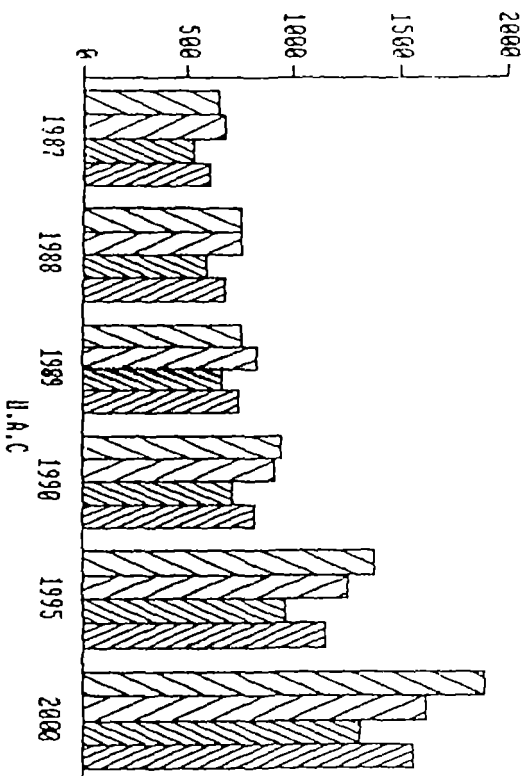and 5 metropolises.

ANNEXURE   I

Charts

CHART I A

TRENDS IN MONTHLY INCOME
(as per month)
J.J.C

U.A.C

R.S.C

DELHI   GHAZIABAD   HYDERABAD   TOTAL

CHART I B

STRUCTURE OF HOUSEHOLD BUDGET
DELHI

WATER (0.9%)

OTHERS (21.4%)

GARBAGE CLEARENCE (0.3)
FUEL (5.0%)

MEDICAL (3.1%)
TRANSPORT (2.5%)

FOOD (66.8%)

GHAZIABAD

WATER (0.6%)

OTHERS (21.8%)

GARBAGE CLEARENCE (0.3)
FUEL (2.6%)

MEDICAL (3.5%)
TRANSPORT (2.5%)

FOOD (68.7%)

HYDERABAD

WATER (0.0%)

OTHERS (23.2%)

GARBAGE CLEARENCE (0.0)
FUEL (6.2%)

MEDICAL (8.2%)

TRANSPORT (3.2%)

FOOD (59.2%)
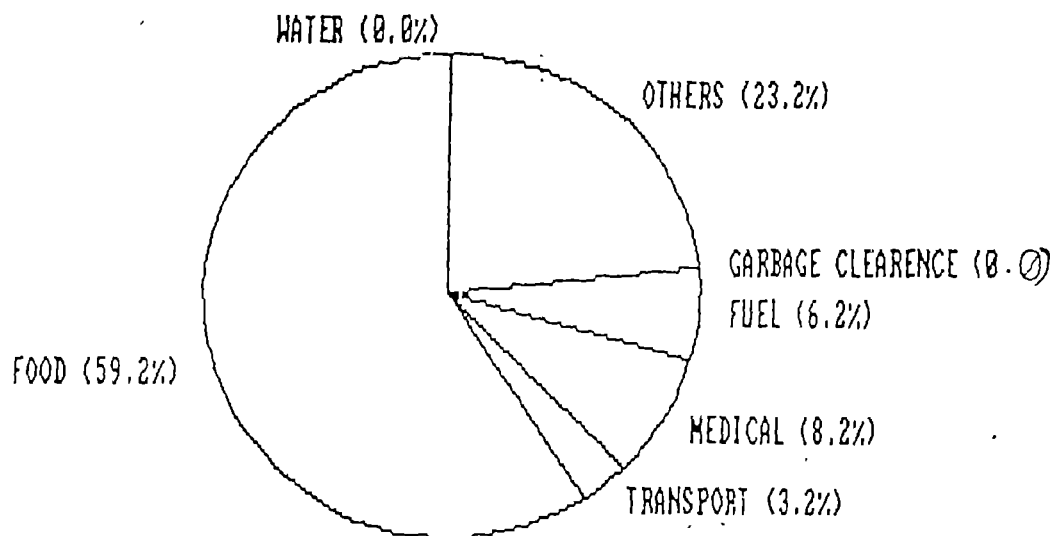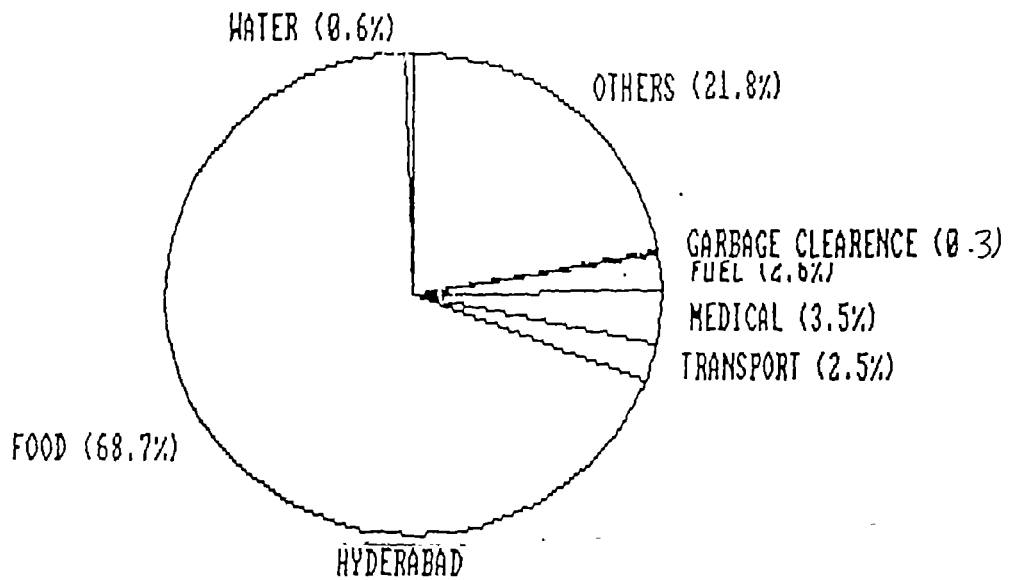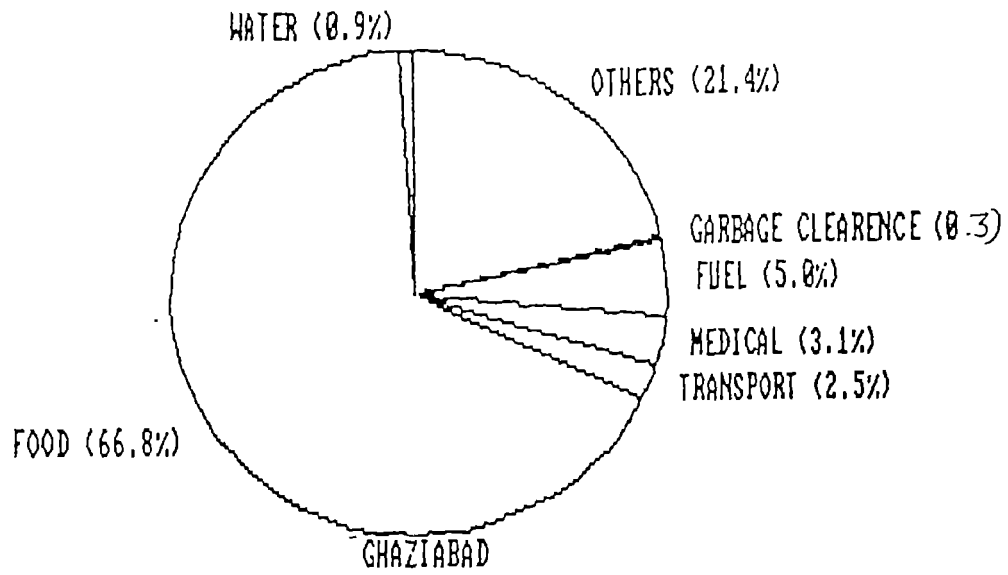
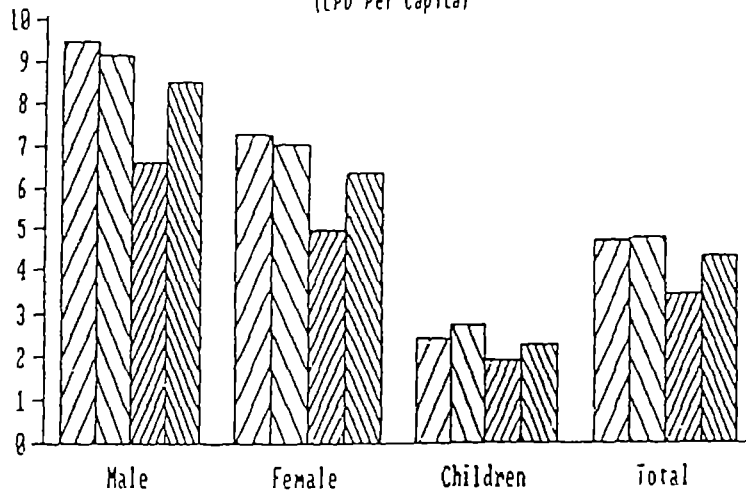CHART   I C   STRUCTURAL PATTERN OF WATER CONSUMPTION
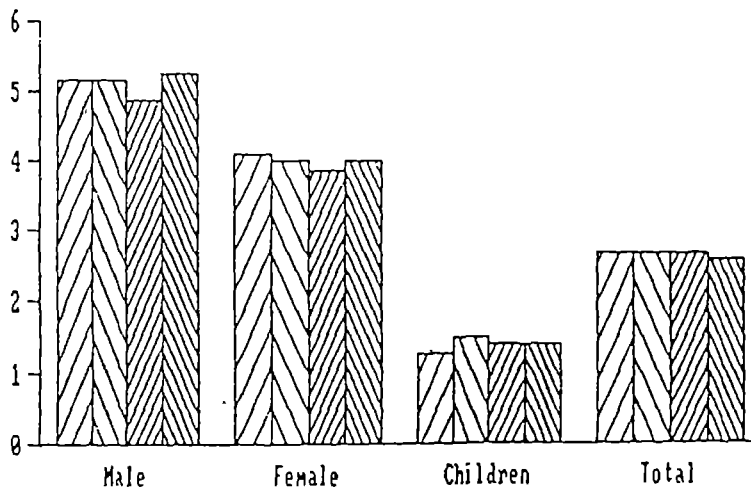   J.J.C   (Percent)

U.A.C

R.S.C
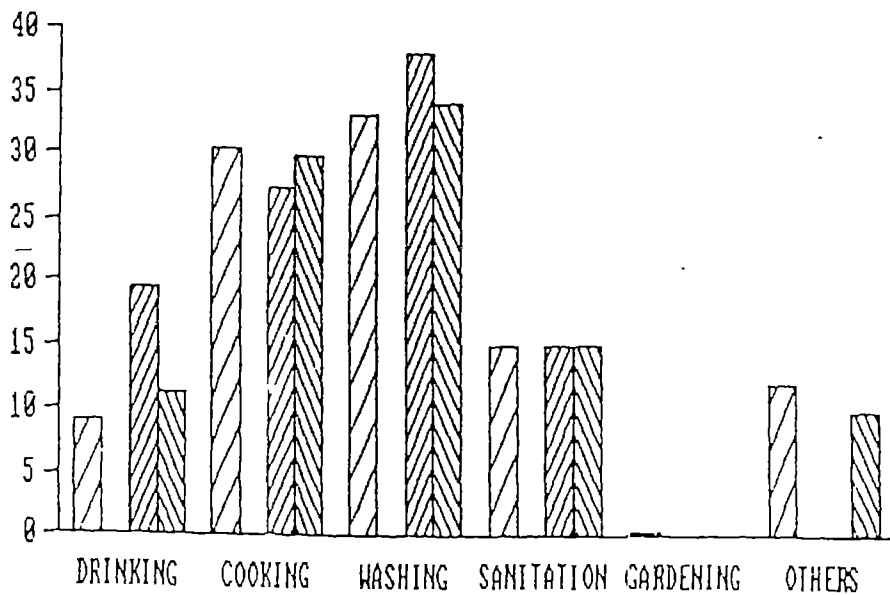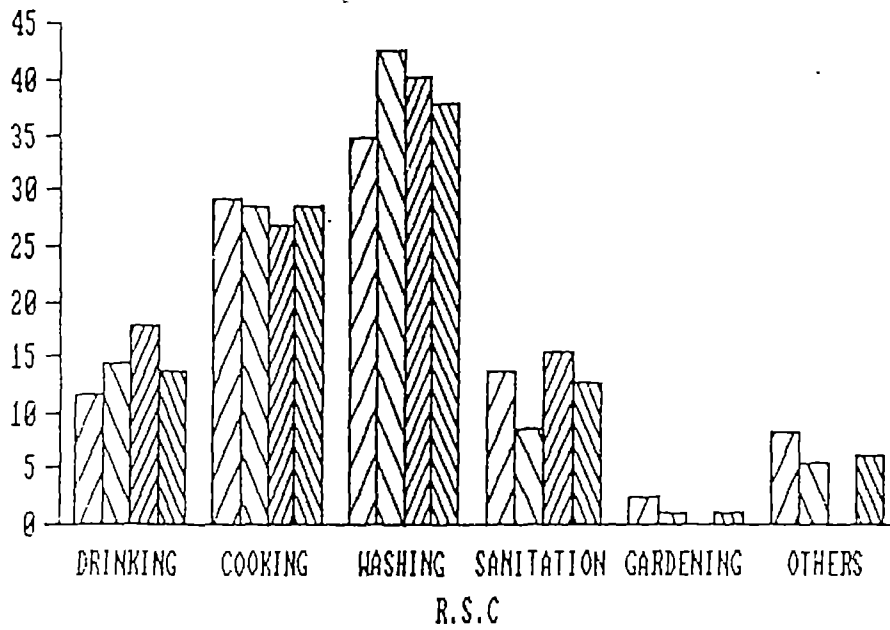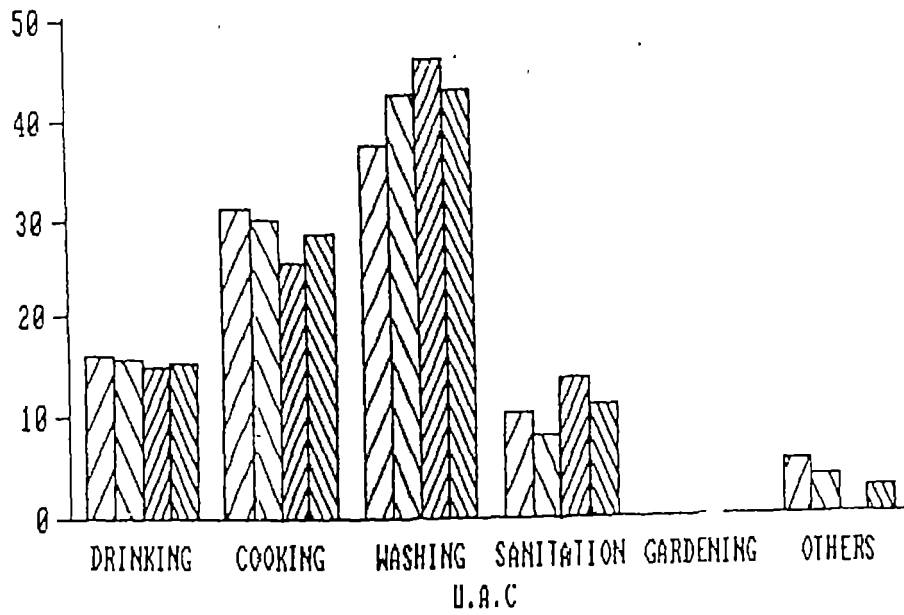
DELHI   GHAZIABAD   HYDERABAD   TOTAL

CHART I D

DAILY DRINKING WATER CONSUMPTION
SUMMER
(LPD Per Capita)

WINTER

MONSOON

[/] DELHI   [N] GHAZIABAD   [Z] HYDERABAD   [N] TOTAL
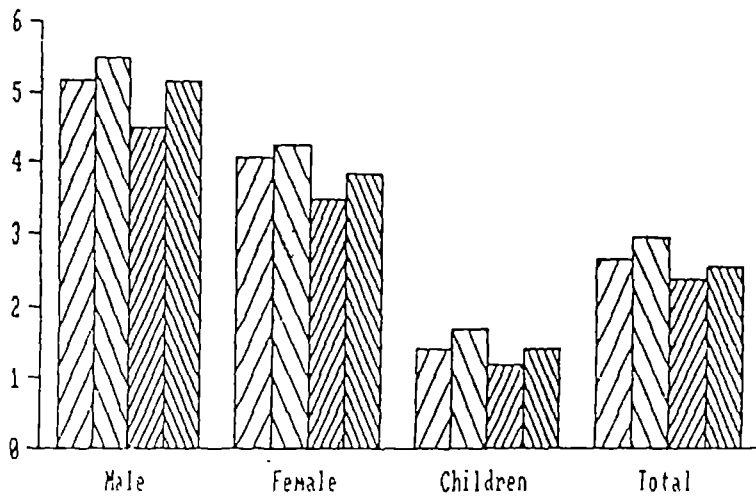
List of Officials and Experts with whom SDS held discussions

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17.. Shambhunath,
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    Ghaziabad Development Authority,
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18. Manjit Singh,
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