DRAFT CONFIDENTIAL

RESEARCH STUDY ON FINANCING, PRICING AND COST RECOVERY - WATER SUPPLY AND SANITATION SERVICES

VOLUME - II
(Analysis on Willingness-To-Pay)

Submitted to :

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CHAPTER - I

INTRODUCTION

CHAPTER I
INTRODUCTION

1.1   **Background**

In the field of infrastructure management, appropriate strategies on financing, pricing and cost recovery are needed to sustain the system. Water Supply and Sewerage (WS & SW) services in particular, need special emphasis in view of the fact that the services play an important role in human resource development. This calls for an approach relevant to suit the present day needs and hence requires appropriate mechanism so that the system could satisfy the following two paramount principles:

a)   Efficient upkeep and maintenance of the system; and,

b)   Create surpluses to meet at least a part of the costs involved in network development/strengthening for present and future.

Presently, these (WS & SW) services are poorly organised in the country. In a way the services are caught in a vicious circle. Some of the reasons are irrational pricing compared to the costs of operation, large component of O&M, excessive concessions, low pressure, consumer's dissatisfaction and low level of willingness to pay and so on. The sector thus presents a picture of mis-utilisation/under-utilisation of the resources requiring considerable improvement. This involves qualitative and quantitative improvement in the provision of the service.

On the other hand, there are considerable initiatives and conditions being created for the private participation under the BOO/BOT framework for the urban infrastructure particularly WS/SW services. This is expected to bring in a metamorphosis in the institutional approach to accomplish better allocation of resources.

As the major funding agency in the field of urban infrastructure development, HUDCO intends to understand the performance of the sector. In this context, the present study is being sponsored by HSMI, a wing of the HUDCO. The study covers eight cities such as : Delhi, Madras, Lucknow, Surat, Visakhapatnam, Solapur, Raipur and Bhubaneswar which exhibit a veriety of management patterns.

1.2   Objectives of the Study

The following are the objectives of the overall study :

1. To review the patterns of pricing, cost recovery and the related management pricing policy

2. To examine the financial performance of the agency

3. To assess the legislative framework for setting of charges and cost recovery

4) To assess the detailed cost of provision of services (both the past patterns and likely future costs including capital and revenue expenditure).

5) To assess performance for nature of services and improvements (reliability, service hours, etc.) and the willingness to pay for these services by different user categories.

6) To develop a simulation model framework for assessing the implications of different investments and pricing strategies on efficiency, financial self sufficiency, affordability and equity.

7) Assess the rate of return from item (6) above so as to help in HUDCO's appraisal process.

8) To assess the possibility of introducing project based bonds for water supply and sanitation and related rates of return and management implications, and

9) To suggest the required institutional arrangements and financial management system for operationalising the preferred options.

1.3   **Purpose of the Present Volume (i.e., Volume II)**

While the Volume I has dealt with at length the objectives from 1 to 4, the purpose of this volume is to dwell upon the objectives related to items 5 to 9. The present volume is based on extensive user surveys - both household level, commercial/industrial/institutional levels covering as large as 4,000 calls aiming at probing into the users' willingnessto pay under different circumstances of supplying the services. The distribution of these samples by city is indicated as follows:

Sample Distribution by City

(Number)

Delhi	Madras	Lucknow	Surat	Visakha patnam	Solapur	Raipur	Bhubaneswar	Total
1000	750	600	500	350	300	250	250	4000

1.4   **A Brief profile of the Selected Cities**

The sample cities covered in the study exhibit a wide range of characteristics related to the economic activity. While some are manufacturing, the others are tertiary sector based. Similarly, while some have registered high population growth and some have vice-versa as shown below:

Typology of Selected Cities

City	Density '000*		Population 1991 (In lakhs)	Annual Growth Rate of population 1981-91	Typology
	1981	1991			
1. Delhi	14	20	72.07	4.7	High Growth high density service-cum industry
2. Madras	19	23	38.41	1.7	Low Growth high density service-cum industry
3. Lucknow	8	14	16.19	7.6	High Growth high density services
4. Surat	7	13	14.99	9.3	High Growth High density industrial
5. Visakhapatnam	7	9	7.52	2.9	Medium Growth medium density service-cum industry
6. Solapur	20	24	6.04	1.8	Low Growth high density industry
7. Raipur	6	8	4.39	2.9	Medium Growth low density mixed base
8. Bhubaneswar	2	4	4.11	8.7	High Growth low density services

Source :   Based on Census of India, 1991
*   Density per sq.km area and figures adjusted to the nearest value

1.5   **The Main Objectives of the Survey on Willingness-To-Pay**

(The questionnaires used in the survey are annexed to this report)

1)   To generate socio-economic profile of the users (including domestic and non-domestic) in terms of : education, income levels of the household, housing characteristics.

2)   To assess the present status of Water Supply/Sanitation Services

3)   Willingness-to-pay for existing/improved services

4)   Willingness to invest in project based bonds

1.6 Method of Selecting Samples

1. Extensive discussions have been held with the concerned officials of the municipality/corporation/PHED/Board. This has helped select the localities.

2. Based on the discussions with the officials of the above agencies, the city has been divided into 5 zones to evenly distribute the sample and also make representation of the household of different income groups and also a range of users from the non-domestic sector

3. To represent households with different experiences in water pressure, water availability, etc. row houses, multi-storeyed flats, bungalows, chawls and traditional house types have been selected by observation.

4. Based on discussion with the officials of the water supply agencies, the following two characteristics have been kept in view for selecting users from the non-domestic sectior :

   a) Areas/localities which are not catered by any public water supply distribution system

   b) Areas/localities which are inadequately/under served

   c) While selecting the non-domestic samples, care has been taken to include mostly water intensive units such as hotels/restaurants, food processing, chemical based units, etc.

1.7 Coverage of the cities/Systems

The study covers eight cities such as : Delhi, Madras, Lucknow, Visakhapatnam[1] Surat, Solapur, Raipur and Bhubaneswar. These cities represent a wide range of management systems like the wholly municipal operation (e.g. Surat, Visakhapatnam and Solapur) totally an autonomous agency like the MMWSSB, and the Delhi WS&SW Disposal Undertaking and so on. On the other hand, there are cities where the state level agencies manage. e.g. PHED in Bhubaneswar,

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[1] The names Visakhapatnam/Vizag are synonymously used in the report

Jal Sansthan in Lucknow. Where the PHED is operating, there is sharing of costs (capital charge on work basis by PHED/Jal Sansthan from the local Body), collection of taxes/user charges on behalf of the PHED by the local body and charging the collection charges accordingly, etc.

1.8 Plan of the present Volume

The Report contains seven chapters. Chapter II presents socio-economic profile of the households(hhs) in terms of family size, education, type of house and its built-up area, employment and income levels. In chapter III, the characteristic features of the hhs have been discussed. This is in terms of the hhs experiences regarding the WS & WS services, reliability, satisfaction level, reliability made on private sources. Chapter IV contains the analysis on the willingness-to-pay (WTP) for the WS & SW services. Under different situations like existing supply improved and new connection - the hhs preparedness to pay for the services.

In chapter V, the role of the capital markets in the infrastructure investment has been discussed. Resorting to competitive bidding of funds in the market for the public investment is of recent origin and more so in the case of the traditionally managed municipal services like the WS & SW. In this connection, the views of the hhs as well as the non-domestic sector particularly the trade and commerce and manufacturing units have been presented, in this chapter.

Development of simulation model framework for assessing the municipalities of different investment and the assessment of the rate of return occupy a crucial place. This aspect has been discussed under two heads : Determinants of WTP; and, Pricing and Simulations. In this connection, Chapter VI serves as an introduction to chapter VII since the former gives an account on the parameters to be used in the model. The latter gives the details on the pricing and simulations. A note on the policy considerations is presented in Appendix -I.

CHAPTER - II

SOCIO-ECONOMIC PROFILE OF THE HOUSEHOLDS

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2.1   Introduction

The purpose of this chapter is to highlight the socio-economic profile of the households (hhs) in the selected cities. The chapter is divided into the following sectors :

a) Household size
b) Age distribution
c) Education
d) Type of house
e) Employment
f) Income

2.2   Household Size

Smaller family sizes are found in the bigger cities. The smallest family size is found in Visakhapatnam, followed by Madras, Delhi, Solapur, Lucknow and Bhubaneswar, Surat, and Raipur, (Table 2.1). But as one goes up the income slab, one finds that the family size increases.

Table 2.1 : Family Size

(Average Number of Persons)

Income Group of HH (Avg. monthly income in Rs.)	SUR	RAI	SOL	BHU	VIZ	DEL	LUC	MAD
<=1500	4.6	5.4	4.9	6.0	3.8	5.1	4.7	4.5
1501-3000	5.2	5.8	5.5	4.9	4.3	5.2	5.5	4.6
3001-4500	5.8	5.6	5.9	5.1	4.6	5.2	5.5	4.9
4501-6000	6.3	5.9	6.0	5.6	5.3	5.4	5.4	4.9
> 6000	7.1	6.5	6.4	6.1	5.0	5.6	5.8	4.7
TOTAL	5.7	5.8	5.4	5.5	4.5	5.4	5.5	4.7

Source : ORG Survey, 1995.

2.3   Age Distribution

In all the cities, the maximum concentration of persons is in the age group of 21-40 years. Visakhapatnam ranks the highest (44.6%) followed by Delhi in the age group of 1-20 years, (Table 2.2).

2.4   Education

As far as the literacy rate is concerned, Madras has recorded the highest followed closely by Delhi and Surat. A common trend noticed in all cities is that the highest percentage of people have studied upto VII standard, (Table 2.3).

Table 2.2 : Age Distribution of Members of Households

(In Percentage)

Age (in years)	SUR	RAI	SOL	BHU	VIZ	DEL	LUC	MAD
1-20	37.4	37.2	34.7	28.3	28.5	39.6	37.8	31.8
21-40	37.5	38.2	41.0	42.8	44.6	36.0	36.4	38.6
41-60	18.2	19.2	18.8	19.4	21.6	18.7	19.9	21.7
> 60	6.9	5.4	5.5	9.5	5.3	5.7	5.9	7.9
Total 100	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source : ORG Survey, 1995.

Table 2.3: Level of Education of the Household Members

(In Percentage)

Level of Education	SUR	RAI	SOL	BHU	VIZ	DEL	LUC	MAD
Literate	10.5	10.3	13.4	3.2	8.6	14.0	8.8	9.4
Up to Primary	15.0	17.5	17.1	9.8	9.4	12.7	18.9	14.2
V to VIIth	61.1	40.4	43.9	28.8	36.4	43.0	28.0	51.3
Under Graduate	2.3	62.5	5.5	16.6	15.3	5.4	8.1	4.2
Diploma	1.0	12.0	1.5	3.1	6.9	1.4	1.4	3.6
Graduate	6.4	10.3	9.0	20.2	4.0	18.0	21.6	12.4
P.G. & Above	1.9	6.9	1.2	14.6	4.0	4.8	9.0	4.5
Total	98.3	92.8	91.7	96.4	95.2	99.3	95.8	99.6

Source : ORG Survey, 1995.

2.5   Type of House

Although income criterion is the deciding factor in the choice of a type of house, other considerations like the scarcity of land, nearness to work spots, cultural preparedness do play a role. Surat and Raipur are the cities where the most popular type of housing is the row type. Surat is a rapidly developing city where the percentage of low income group people is very high due to the labour-intensive industries. Despite metropolitan culture and land shortage, hhs preference for row houses appears to be high in the city. The perference appears to be in view of the fact that a higher appreciation of land values is possible in the case of row housing than in the case of multistoried.

Solapur and Bhubaneswar are comparatively with low growth rates. The scarcity of land has not been much pronounced in these cities. Consequently, Bunglow type houses are a common feature in these two cities as more land is available. Delhi predominantly shows tenements as the most popular type of housing. The hhs have preference for high rise apartments and also flats. Fast growth and of the city and scarcity of land appear to be the prime reasons for such a situation. Similar tendency is shown by Lucknow and Madras too where most of the hhs stay in flats upto three storeys.Bungalows are more popular only in the higher income group (ie. above Rs.6000), (Table 2.4).

Table 2.4 : Most Popular Types of Houses in Each Income Group

(Name)

INCOME GROUP	SUR	RAI	SOL	BHUB	VIZAG	DELHI	LUCK	MAD
<= 1500	row	hut	hut	bung	hut	tenmn	hut	hut
1501-3000	row	row	bung	bung	tenmn	tenmn	pole	pole
3001-4500	pole/row	row	bung	bung	tenmn	tenmn	pole	flat 3
4501-6000	row	row	bung	bung	tenmn	tenmn	pole	flat 3
> 6000	row/bung	row	bung	bung	tenmn	tenmn	bung	bung
TOTAL	row	row	bung	bung	tenmn	tenmn	pole	-

Source : ORG Survey, 1995.

bung = bunglow
tenmn = tenement

2.6   Household by Number of Floors

It is observed that the maximum number of hhs have a tendency to stay in the lower floors. This can be related to the level of urbanisation of the cities and higher density of population. Howerver, given a choice, people prefer lower floors either due to their cultural backgrounds or also due to the fear that the higher the floor, the lower the water pressure, (Table 2.5).

Table 2.5   Households by Number of Floors

(% hh)

No. of Floors	SUR	RAI	SOL	BHU	VIZ	DEL	LUC	MAD
1 - 3	35.1	20.8	76.5	79.0	74.7	85.4	88.8	64.7
4 - 6	18.8	24.5	12.3	14.0	15.7	8.5	8.9	19.8
7 - 10	19.8	22.2	5.2	5.6	7.3	5.3	.2.4	6.5
> 10	26.3	32.5	6.0	1.4	2.3	0.8	0.0	9.0

Source : ORG Survey, 1995.

2.7 Households Having Their Own Houses

A very high percentage of hhs in all income groups have their own houses. The highest percentage of the owned houses is in Bhubaneswar at (99.5%) and in the other cities, it ranges from 73% to 88%. An important aspect is that more is the income, more are the own houses,(Table 2.6).

Table 2.6 : Households with Own Houses

(% hhs)

INCOME GROUP	SUR	RAI	SOL	BHU	VIZ	DEL	LUC	MAD
(% to sub tot) <=1500	69.2	86.7	85.5	100.0	78.9	87.7	89.6	69.6
1501-3000	70.8	85.0	85.9	100.0	82.1	83.8	84.8	78.2
3001-4500	86.5	82.4	83.3	100.0	85.1	82.6	81.3	71.8
4501-6000	86.4	89.2	96.2	97.8	92.7	81.6	89.5	73.7
> 6000	94.7	92.0	100.0	100.0	91.4	82.1	90.6	68.7
TOTAL	78.8	86.6	87.7	99.5	84.3	83.0	87.9	72.8

Source : ORG Survey, 1995.

2.8 Age of the House

The oldest houses from the sample cities are found in Raipur and Surat. The average age of the houses in these cities is around 34 years. But there is no fixed trend among these cities regarding the age of the house and the income group,(Table 2.7).

Table 2.7: Age of the House

(Years)

INCOME GROUP	SUR	RAI	SOL	BHU	VIZ	DEL	LUC	MAD
<= 1500	27.9	42.5	20.9	3.5	23.5	15.5	19.6	26.3
1501-3000	34.5	30.1	22.6	21.0	19.3	15.5	32.3	23.5
3001-4500	34.3	26.5	19.8	25.3	23.9	16.3	24.8	20.8
4501-6000	39.0	35.9	23.9	22.1	23.6	18.2	24.4	38.4
> 6000	26.1	27.9	41.5	20.6	17.9	19.0	21.5	20.3
TOTAL	33.3	33.7	23.4	21.8	21.3	17.2	24.2	23.6

Source : ORG Survey, 1995.

2.9   House Owners (Owning Pucca House)

As the income increases, the percentage of hhs having pucca houses also showed an increase in all the eight cities, (Table 2.8).

Table 2.8 : Households with Pucca Houses

(% hhs)

INCOME GROUP	SUR	RAI	SOL	BHU	VIZ	DEL	LUC	MAD
<=1500	70.8	38.3	39.0	100	57.7	69.2	8.9	50.5
1501-3000	80.9	66.7	51.8	89.8	86.8	86.2	51.4	80.8
3001-4500	86.5	85.3	66.7	90.2	93.6	93.0	70.7	87.3
4501-6000	85.2	83.8	69.2	91.1	97.6	96.0	72.8	95.0
> 6000	98.2	96.0	91.3	97.5	94.3	97.7	89.5	95.8
TOTAL	83.3	68.1	53.0	93.0	83.3	91.4	66.5	76.8

Source : ORG Survey, 1995.

2.10 . Area of the House

Average built up area is a function of income. However, space limitations, locational preferences, etc. might also be the factors influencing decisions or preference patterns in favour of smaller areas by the well-to-do families.Visakhapatnam is the city where the average area of the house is quite large in all income categories compared to the other cities, eg. the average area of house in Rs. 6000 income group is as high as 287 sq.m. whereas the lowest is 119 sq m in Madras. The cities such as Lucknow, Raipur, Bhubaneswar, Solapur, Delhi, Madras and Surat follow Visakhapatnam in that order, in terms of average area of the houses across the income groups.

The size of houses in Surat is small compared to all other cities because of the high land prices. Next in the line in smallness of houses are the metropolises-Madras and Delhi with costly land, (Table 2.9).

Table 2.9 : Area of the House

(sq.m)

INCOME GROUP	SUR	RAI	SOL	BHU	VIZ	DEL	LUC	MAD
<=1500	52.4	93.0	82.6	73.0	116.9	44.8	31.1	63.1
1501-3000	64.7	97.0	93.5	86.4	158.3	58.5	102.1	96.4
3001-4500	70.1	174.3	137.5	114.1	145.5	74.6	132.0	87.6
4501-6000	76.9	162.3	108.6	131.7	200.2	91.0	176.9	111.7
> 6000	149.4	155.0	131.5	135.0	286.6	141.2	208.5	119.2
TOTAL	77.2	126.0	98.2	119.0	166.8	91.8	149.9	91.2

Source : ORG Survey, 1995

2.11 Employment

The highest rate of employment is in Madras (36%). This is followed surprisingly by the smaller towns like Solapur and Lucknow. The lowest employment rate is in Raipur. The trend in all the cities shows that as the income level increases, the employment rate also does so. The percentage is high at all income levels in Lucknow. In Surat, the

middle income groups show more employment than the lower or the higher ones,(Table 2.10).

Table 2.10 : Persons Employed

(%)

INCOME GROUP	SUR	RAI	SOL	BHU	VIZ	DEL	LUC	MAD
(% to subtot) <=1500	27.2	25.3	29.2	33.3	30.5	22.3	32.6	30.8
1501-3000	30.0	29.1	33.0	23.1	32.5	25.4	31.5	33.7
3001-4500	33.2	27.6	31.4	28.0	29.8	29.7	29.9	37.5
4501-6000	33.2	29.4	34.4	28.6	32.2	33.4	28.3	39.0
> 6000	29.0	34.3	25.2	36.2	33.9	36.8	35.5	43.0
TOTAL	30.6	28.6	32.2	30.5	31.8	31.1	32.2	36.0

Source : ORG Survey, 1995.

2.12   **Unemployment**

The lowest percentage of unemployed people is in Surat (0.3% to the total population). This is because most of the people have some work in various types of labour intensive industries like the textiles, construction, etc. On the other hand, the highest unemployment rate is in Bhubaneswar ie. 5.2% followed by Visakhapatnam(4.8%) and Madras(4.2%).

The hhs in the middle income groups show the highest rates of unemployment. In case of Visakhapatnam, the highest unemployment (7.0%) is found in the <1500 income group households.(Table 2.11). This might be so because the tertiary sector is small or because the industries offering unskilled jobs is less. This is evidenced by the gigantic steel mill with high level of automation as a measure to reduce the unit costs.

Table 2.11: People Unemployed

(%)

INCOME GROUP	SUR	RAI	SOL	BHU	VIZ	DEL	LUC	MAD
(% to subtot) <=1500	0.0	1.2	0.9	0.0	7.0	2.1	1.0	4.3
1501-3000	0.1	2.6	1.1	5.4	6.1	1.2	2.1	6.6
3001-4500	0.0	4.2	1.4	7.7	4.6	17.3	2.7	4.0
4501-6000	0.5	5.5	0.0	5.9	3.3	1.3	2.5	2.5
> 6000	0.7	1.8	0.0	3.7	0.0	1.2	3.2	1.5
TOTAL	0.3	2.9	0.8	5.2	4.8	1.4	2.5	4.2

Source : ORG Survey, 1995.

2.13   Employment by Type

The type of employment pursued has varied among the cities. While it is the self employment that has emerged as the most popular one in the case of Surat, it is the organised employment in the case of other cities (Table 2.12).

Table 2.12: Employment by Type

(Major Types by name)

INCOME GROUP	SUR	RAI	SOL	BHU	VIZ	DEL	LUC	MAD
<= 1500	Unorg S. Tmp	Slf Emp SSI	Others	Slf Emp SSI	Others	Slf Emp SSI	Others	Others
1501-3000	Slf Emp SSI	Slf Emp SSI	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm	Slf Emp SSI	Org S. Perm
3001-4500	Slf Emp SSI	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm
4501-6000	Slf Emp SSI	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm
> 6000	Slf Emp SSI	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm
TOTAL	Slf Emp SSI	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm	Org S. Perm

Source : ORG Survey, 1995.

Unorg S Tmp = Unorganised Sector Temporary
Org S Perm = Organised Sector Permanent
Slf Emp SSI = Self Employed (Small Scale Industries)

2.14 **Monthly Income**

The highest monthly income is found in Delhi, Bhubaneswar, Lucknow and Surat. The lowest monthly income is depicted by Solapur. This is because its textile industry appears to have reached a state of stagnancy and also other service sectors are not able to provide competitive remuneration. However, in terms of average incomes, Surat's experience is outstanding, with higher than the rest of the cities, at Rs.18,500/m. This is understandable in view of its self employed and SSI based manufacturing. Delhi also exhibits high average income more of tertiary sector, (Table 2.13).

Table 2.13: Monthly Income

(Rs/m)

INCOME GROUP	SUR	RAI	SOL	BHU	VIZ	DEL	LUC	MAD
<= 1500	1332.3	1117.3	1109.3	1500.0	1034.3	1272.3	993.2	1008.3
1501-3000	2460.1	2388.8	2434.7	2516.4	2412.3	2537.3	2526.7	2399.4
3001-4500	3928.8	3860.7	4054.2	3986.8	3778.7	3884.0	3908.0	3896.3
4501-6000	5392.0	5289.2	5319.2	5232.9	5346.3	5367.4	5434.2	5357.6
> 6000	18508.7	9556.0	8717.4	10129.1	9051.4	11745.5	9894.2	10212.8
TOTAL	5194.6	3594.3	2854.7	6157.9	3475.8	6049.2	5678.0	3756.4

Source : ORG Survey, 1995.

CHAPTER - III

CHARACTERISTICS FEATURES
OF THE SERVICES

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CHARACTERISTIC FEATURES OF THE SERVICES

3.1   **Introduction**

By no means the WS/SW management is the same across the states. Even within a state, the situations are different from location to location due to various considerations. It is in this context, an attempt is made to understand the general characteristic features of the WS/SW services across the selected cities.The following are the major issues that have been discussed under each of the service, viz., WS/SW services.

A.   In the case of WS service

    a)   Sources of water and the nature of ownership of these sources.

    b)   The methodological and the logistic aspects related to obtaining water connection from the public authority.

    c)   Quality of WS in terms of reliability,and satisfaction level and quantity of water supplied.

    d)   HH expenditure on WS in terms of payment to the public authority and capital investments made on HH infrastructure related to water supply.

    e)   The preference pattern of the HHs for improvement in WS.

    f)   Choice of payment for the services.

B.   In the case of SW service

    a)   Coverage of the service

    b)   Type and level of service

    c)   Expenditure incurred by HHs on the Municipal service and non- municipal services

    d)   Preference for improvement in the service.

In addition, the views of the non-domestic sector and the preference pattern of this group of user in the case of WS/SW have also been ascertained and presented separately in this chapter.

PART A
Water Supply

3.2   **HHs With Municipal Water Connection**

The maximum coverage of municipal WS is found in Delhi with 87 % hhs having the connection followed by Bhubaneswar with 79 % and Surat with 72.3 % hhs. It is observed that the number of municipal water connections are directly proportional to the hh income. The highest income groups have the maximum number of water connections. A couple of exceptions like Surat and Vizag show that the income group of Rs. 3000 -4500 is the one which is the best served **(Table 1)**.

3.3   **Coverage of Industries (Including Mfg., Hotels/ Restaurants, Institutions, Etc.) by Municipal Connections**

Looking across the 8 cities, it is clear that the percentage of industries having municipal connection is more or less equal to the percentage of HHs having municipal connection in the same city. This trend is broken by Madras. In this city, only 22 % of the industries have municipal connection whereas 57 % of the hhs have municipal connection. The lower percentage of municipal connections to industries could be due to the following reasons ;

a)   Madras being a city with scarce supplies of water, hhs are given preference over industries for the water connections.

b)   Industries might prefer to buy water or have their own wells, than face the erratic water supply of the public water supply system.

Similar to Madras is the situation existing in Raipur with 66 % of the hhs having municipal connections while only 45 % of the industries have the same. The reasons for such a situation in Raipur is due to low pressure of water which has bothered the industries. It is also evident that quite a high percentage of industries have metered

connections whereas they are almost unheard of in the case of the hh sector. For instance, in Bhubaneswar 95 % of the industries reported having metered connections.This can also be due to the fact that the industries consume a large amount of water and therefore metering helps in keeping an account of the water utilised.The following Table reveals the percentage of metered connections in the case of industries.

Industries-Percentage of metered connections

Description	SURAT	RAIPUR	SOLAPUR	BHUB.	VIZAG	DELHI	LUCK.	MADRAS
Percentage of ind. having metered conn.	40 (70)	60 (45)	92 (50)	95 (80)	63 (57)	87 (89)	55 (75)	18 (22)

Note : Figures in brackets are number of sampled industries.
Source : ORG Survey, 1995.

3.4　HHs Having Individual, Shared And Public Water Supply

The selected cities exhibited a trend of having a variety of sources. This ranges from having an individual water connection, sharing with neighbours and also depending on public standpost. HHs having individual water supply is the subset of those having municipal water connections. All the HHs who have water connections consist of those who have individual/ shared as well as public water supply connections.

Bhubaneswar is the city in which the maximum number of hhs have access to municipal individual water supply (78%) followed by Delhi (74%). Solapur comes third (51%). Madras is the city where the percentage of hhs having individual connections is very low (17%). This is due to the heavy scarcity of water in the city. Bhubaneswar is also an unique exception in that, it has nil shared WS and only 0.5% public connection. All this is understandable since Bhubaneswar is a riverside city, and thus has easy access to ample water supply. In the rest of the cities, the trend is varied with more HHs preferring public water supply to shared Water supply. There could be two reasons for this :

a) Shared WS could precipitate a quarrel among the sharing hhs regarding the time to collect water, quantity, etc.

b) Public WS is quite reliable and is available at fixed hours, when all have to collect water amicably (Tables 2,3,4).

3.5 Public Water connection or standpost

In addition to individual and shared municipal connections, usually public water connections are also given. This could be in the form of stand posts or hand pumps. This facility could be situated near or happens to be far away from the households. The members of the hh are required to go and collect water which becomes quite time consuming. Nevertheless, this system is still existing in all the cities.The following analysis brings out a variety of aspects related to the public water connection /standpost in terms of distance, water collection time and so on.

3.5.1 Public System - Average Distance

The shortest distance required to be travelled to reach public water supply system is found in Bhubaneswar. As stated in the previous section, in this city, maximum number of hhs have access to individual municipal water supply. So, very few hhs resort to bringing water from the public standposts or handpumps. However, distances vary from city to city.For instance,the average distance to be travelled to fetch water in Solapur is 311 m. followed by Delhi with 186 m., Lucknow with 150 m., Raipur with 100 m. , Madras with 91 m.; and, Surat with 80 m.(Table 5).

3.5.2 Average Collection Time

The average collection time from public system relates directly with the average distance of the hhs from the public supply system. As Solapur has the maximum average distance to public system so is the average collection time the maximum among all eight cities. i.e. 1.6 hrs. Similarly,in Bhubaneswar, as distance is the least so is the

collection time of only half an hour. For all other cities, the collection time lies in the range of 30 to 90 minutes (Table - 6).

3.6 Households Sharing water connection

Cases where sharing of public source have been reported, an attempt has been made to elicit information regarding sharing of water source.The higher number of households reported sharing in Madras. This is quite understandable considering the scarcity of water, the less reach of municipal water to the population and also, the lesser number of public water supply outlets. Visakhapatnam and Lucknow follow Madras in this respect. The minimum number of households sharing are in Bhubaneswar. There are only 2 % of households which reported sharing municipal sources in this city. The middle income category shows the maximum households that are sharing. But in any given income group, percentage of households sharing does not exceed 28 % (Table 7).

3.7 Municipal House connection

A wide range of aspects related to the age of connection , average hours of municipal supply, level of satisfaction, etc., have been presented as follows:

3.7.1 Age of Individual Water Connection

Those hhs which have reported having their own connection have been contacted. It is observed that very low percentage of HHs have connection older than 40 years. In the case of Surat, it is 17% of connections nearly 30 years old. In Solapur and Raipur the connections are less than 5 and 10 years old respectively. In the rest of the cities the connection are around 15 years old (Table 8). The age of the connections generally gives an idea as to why the number of connections and state of the water supply is so varied in the 8 cities.

3.7.2   **Time Taken to get New Connection**

From the date of application,it takes generally about 15 days to get a new connection. Although in cities like Raipur, Solapur, Vizag, Delhi and Madras, it is reported to have been taking around 30 days . Although the municipal water supply in Bhubaneswar is comfortable and around 99.3 % of hhs have recorded getting connection within 15 days, there are instances of getting (7% of hhs) their connection after nearly two months. This discrepancy is understandable since sometimes unforseen circumstances like the submission of documents not being in order may delay the sanction of the connection (**Table 9**).

3.7.3   **Hours of Municipal Supply in a day**

The situation in Surat, Solapur and Madras is just alright since they get water for about 2 hours. The situation in Vizag is the worst among the 8 cities since it gets water only for less than an hour.   The condition in Raipur and Bhubaneswar is comfortable with around 4 hours water supply, Whereas Delhi has recorded the maximum water supply of more than 6 hours.

But greater hours of supply does not necessarily lead to more water since amount of water obtained also depends on the pressure of the supply as is observed by the level of satisfaction in all the cities (Table-10).

3.7.4   **Satisfaction Level**

Every water supply system has got its own flaws and therefore needs improvement. If the user is not satisfied with the quantity, naturally the dissatisfaction is more than if he is dissatisfied with the cost.

3.7.5   **Satisfied With Municipal Water Supply :**

The highest satisfaction level among the consumers towards the level of water supply is followed in Surat and Bhubaneswar. This is so as these two cities are among those having the highest percentage of

households with municipal water connection, a good public water supply network as well as a large number of households having individual water supply connections. The hhs in Lucknow, Raipur and Solapur are a dissatisfied lot recording 16 %, 17 % and 30% of households satisfied with the existing supply (Table 11).

3.7.6 Satisfaction Level of Non-Domestic Sector

An attempt is made to elicit the views of the non-domestic sector.In this connection, the maximum satisfaction (71% of the units) is obtained by Bhubaneswar followed by Delhi (56%) and Solapur (55%). The respondents of Surat are not satisfied with the service. This is because there are innumerable Small Scale Industries in this city and most of the industries have reported not getting the required quantity and quality of water as shown in the following Table. In Surat, the water supply being less than comfortable, the HHs generally gain precedence over the non-domestic sector.

Satisfaction Level of the Non-domestic Users (Industries)

(Percentage of Respondents/Units)

DESCRIPTION	SURAT	RAIPUR	SOLAPUR	BHUB.	VIZAG	DELHI	LUCK.	MADRAS
a) Quantity	20	35	50	65	-	47	18	33
b) Timing	14	45	42	55	-	37	27	33
c) Quality	2	55	83	70	-	66	50	35
d) Reliability	34	40	50	85	-	59	65	34
e) Consumption charge	38	30	50	80	-	71	52	34
Total	22	41	55	71	-	56	42	34

Source : ORG Survey, 1995.

3.8 Problems Faced For Municipal Water Supply

The water is not supplied with enough pressure is one of the common complaints of all income groups in most of the 8 cities. Only Delhi, Madras and Surat differ from this view point. Delhi which has long hours of water supply has also recorded supply with good pressure. However, the major problem in this case is that there is less supply

during summer. Though the level of satisfaction in Surat is high, they lament about inadequate supply of water . This is common among all the income groups. This indicates that the supply is not evenly distributed. Less supply in summer and supply in odd timing are the problems faced by Madras (Table 12).

3.8.1 Municipal Water Used In Summer by Household Sector

The cities with drier climate and prolonged summer report more usage of water. Households in Surat obtain on an average 131 LPCD (i.e. about 7 buckets of water per capita per day) followed by Raipur, Bhubaneswar, Lucknow, Solapur, Visakhapatnam, Delhi and Madras.

3.8.2. Municipal Water Used By The Non-Domestic Sector

It could be observed that the average quantity of municipal water used by the non-domestic sector per day is the highest in Solapur at. 1,54,000 Lt/day and in Surat 50,000 Lt/day. This is understandable in both the cities in view of the textile industry dominating the city's industrial structure as revealed by the following Table :

Water Supply Consumption by Non-Domestic Sector

(In Kl)

DESCRIPTION	SURAT	RAIPUR	SOLAPUR	BHUB.	VIZAG	DELHI	LUCK.	MADRAS
Water consumption	50 (50)	111 (20)	154 (12)	55 (20)	37 (35)	5 (112)	5 (40)	3 (105)

Note : Figures in brackets are number of non-domestic units surveyed.

Source : ORG Survey, 1995.

3.9 Municipal Expenditure

The Household's expenditure on WS could be divided broadly into two - expenditure on municipal supply and expenditure on non-municipal. The former includes water tax, water charge, which are recurring payments meant for general development of the service and with quid pro quo respectively. In addition, water connection charge, a one time

levy meant for meeting the cost of the pipeline, meter, etc. However, these levies are varied in the 8 cities. They depend upon a variety of factors such as (a) Availability of Water, (b) Satisfaction of the User and (c) Willingness to pay.

3.9.1 Expenditure on Municipal Levies

a) **Water Tax :** This is levied as a percentage to the Annual rental value of the property. Cities with higher taxes are Solapur and Raipur with around Rs 284 per year. The lowest tax is charged in Surat at Rs. 37 per year. In Bhubaneswar and Visakhapatnam, there is no water tax but only water charge levied on tap or connection basis (Table 14).

b) **Water Connection Charge :** A look across the 8 cities reveals that the highest charge for water connection is paid by the HHs in Madras at an average of Rs 3400, going up to Rs. 4400 in the middle income group. The connection charge in Vizag is also on the higher side at Rs.3100. Scarcity of water in these cities leads to higher connection charges. The lowest connection charge is Rs. 341 levied in Bhubaneswar.

c) **Water Charge :** Visakhapatnam (Rs.574) followed by Delhi (Rs.341)have the highest water charge per annum. The lowest is in Surat (Rs.67). The difference is very pronounced in the highest and lowest ranges of water charge. Interestingly, there exists a great deal of affordability and WTP expressed through satisfaction (Table 15).

d) **Water Charges Paid By The Non-Domestic Sector :** The trend followed by the non-domestic sector in paying water charges is completely opposite to that of the domestic sector. In Surat, it pays the highest charge of Rs. 3.83 lakhs per year. This might be due to the fact that the Industries in Surat being water intensive ones (e.g., Textiles) requiring water in large

quantity and are ready to pay the charges for the same. Madras ranks second and pays an amount of Rs.0.67 lakh per year. The lowest charge is paid by Lucknow as follows : Discussions with the officials have revealed that due to shortages of water supply, most of the industries in Madras have gone in for their own private source.

Water Charge paid by non-domestic sector · (In Rupees)

SURAT	RAIPUR	SOLAPUR	BHUB.	VIZAG	DELHI	LUCK.	MADRAS
382904	29880	9564	12205	34247	4569	4659	67091

Source : ORG Survey, 1995.

3.9.2 Non- Municipal Capital Expenditure on Sources of Water

This expenditure is mostly on the open or sanitary well fitted with a booster set or tubewell. HHs which do not have municipal water connection usually have an alternate source of supply since water is a commodity which has inelastic demand. The capital invested by the HHs varies from city to city. The highest capital investment of Rs 8500 on an average is spent by the HHs in Solapur and this even goes up to Rs 12000 in the case of middle income group is followed by Bhubaneswar where a HH spends Rs 8256 on an average even with reliable water supply in non-municipal source of water supply. The reason could be that these investments were on tubewell that had taken place before the municipal WS system had spread in the whole city, as the WS system here is only around 15 years old.

Non Municipal Capital Expenditure on Sources of Water (Non Domestic Sector)

The capital expenditure on non municipal source of water like tube well/ Bore well etc by the non-domestic follows an almost similar trend like that of domestic sector Solapur industries have invested an amount of Rs.1.09 lakh followed by Bhubaneswar (Rs.1.05 lakh) and Surat (Rs.0.69) as follows :

Capital Expenditure By Non-Domestic Sector On Non-Municipal sources.

(Average in Rs. per Unit)

SURAT	RAIPUR	SOLAPUR	BHUB.	VIZAG	DELHI	LUCK.	MADRAS
68965	17400	109500	104696	12649	27024	16308	4977

Source :   ORG Survey, 1995.

3.10   Maintenance Expenditure on Non-municipal Sources

a)   **Domestic Sector** : This expenditure is in terms of electricity bill, repairs and replacements, spares like bolts, nuts, washers, etc. The highest average maintenance expenditure incurred is expended by the HHs of Solapur at Rs.230. As in Solapur, the main source of water is the hand pumps and bores naturally maintenance on them being costly, a lot of money is poured into it by HHs. The HHs in Delhi spend an average of Rs.116 per year on maintenance. In Vizag, Delhi, Lucknow and Madras, the maintenance charges on the borewell is the highest. In the other cities it varies from pump.to storage to handpump (Tables 19 and 20).

b)   **Non-Domestic Sector** : Similar to the domestic sector is the non-domestic sector. Solapur ranks the highest and spends Rs.1.09 lakh per year on maintenance of non-municipal facilities followed by Vizag (around Rs.0.79 lakh) on maintenance of non municipal facilities as follows :

Maintenance Expenditure By Non-Domestic Sector

(In Rs. Per Annum by an Industrial Units)

SURAT	RAIPUR	SOLAPUR	BHUB.	VIZAG	DELHI	LUCK.	MADRAS
7949	3104	109383	9755	79411	2504	2014	5098

Sorce : ORG Survey, 1995.

3.11 Purchase of Water from Private/Public Source in Last One Year

a) **Expenditure On Private Purchase Domestic Sector** : Private purchase of water entails purchase from tankers, private bore wells, etc. Generally, private purchase of water is required in cities where the HHs do not have any alternative source to the municipal connections to fall back upon as in the case of Madras. In this connection, HHs in Madras at an annual average expenditure of Rs.1030 is followed by Lucknow, Surat, Delhi (Table 21).

b) **Expenditure on Private Purchase Non-domestic Sector (Industrial):** There is a drastic difference in the domestic and non-domestic sector. The industries of Vizag spend the maximum on private purchase of water at Rs.7880 per month which amounts to Rs.0.95 lakh per year in the same city. In the case of Madras, this works out to as 3035 as follows :

Expenditure by Non-domestic Sector on Non-Municipal Water

(Rs. per annum)

SURAT	RAIPUR	SOLAPUR	BHUB	VIZAG	DELHI	LUCK	MADRAS
2395	7000	1208	000	7880	1117	1730	253

Survey :   ORG Survey, 1995.

3.12 Views on the Municipal Charges and the Reasons

More than 60% of the HHs in Vizag and Solapur find the municipal charges high. Even around 50 % of the HHs in Raipur and Madras find the charges high.

3.13 Pattern of Preference for Improvement in Municipal Water Supply

For water supply to be perfect, there are many aspects, to be in proper order. These relate to : a) House Connection, b) Quantity, c) Quality, d) Public Tap, e) Pressure f) Cost. However, most of the HHs have two main complaints about the pressure and quantity of water.

But the preferences for improvement may not follow the same trend, as the observations below show (Table 23).

a) **First Preference For Improvement in Water Supply** : When asked for the first preference for improvement, the answer of the HHs in Madras, Solapur and Vizag was in favour of provision of house connection. In the other cities, especially Bhubaneswar and Delhi whose HHs obtain quite a sufficient quantity of water, the emphasis for improvement is on pressure. Some of the HHs in these cities would also prefer an improvement in the quantity and quality of water and also provision of public taps (Table 24).

b) **First Preference For Improvement In Municipal Supply in the Industrial Sector** : In the previous section we observed that the non-domestic sector of Surat lament about the quality of water while those of Raipur and Solapur are not satisfied with the rates of user charges. Solapur also has a problem with reliability. Madras, Delhi and Bhubaneswar have a problem of timing and Lucknow about quantity. Madras is not satisfied with any aspect of water supply.

In spite of the above, most of the cities like Surat, Solapur, Bhubaneswar, Delhi and Lucknow prefer quantity of water to be improved whereas Madras and Raipur prefer quality to be improved. The second preference also mainly revolves around the quality and quantity aspects. Thus it could be concluded that in any given city, preference for improvement is in the form of quality and quantity of water, as evident in the following Table.

Preference for Improvement - Non-Domestic Sector

DESCRIPTION	SURAT	RAIPUR	SOLA PUR	BHUB.	VIZAG	DELHI	LUCK.	MAD RAS
Improvement in Muni.& supply	-	-	-	-	-	-	-	-
1st Preferred (Name / %)	a,b, 20	c50	a,c,e, 17	a,b25	-	a,b,35	a, 40	c,38
2nd ""	d, 4	a,20	b, 8.3	c,20	-	c,14.3	c,20	a, 3.8
3rd ""	c,e 2	b,d, 10	d -	d,e,10	-	d, 5.4	b, 5	b, 95
4th""	-	e,5	-	-	-	e,3.6	d,2.5	d,e, 0
Last""	-	-	-	-	-	-	-	-

Source : ORG Survey, 1995.

LEGEND : a = Quantity
b = Timing
c = Quality
d = Reliability
e = Consumption Charge

3.14 Choice of Payment User changes

While most of the cities have monthly or half yearly collection system.The preference pattern has widely varied among the households.It is believed that the choice of payment in terms of its periodicity is one of the determinants in the WTP.An attempt is made to enquire into the choice of payment of the households on monthly, bimonthly, quarterly, half yearly and yearly basis.

3.14.1 Choice of Payment - Household Sector

The HHs either prefer yearly or half yearly payments. Yearly payment is preferred in Surat, Raipur and Solapur and Half yearly payments in Bhubaneswar, Vizag, Lucknow and Madras with very few exceptions (Table 25). Delhi is the sole exception in that the HHs prefer to have monthly payments. The justification for yearly payment given by the HHs is as follows :

a) Yearly/half yearly payments make it easier for the HHs to pay the charges and forget it for a long time.

b)   Time spent on payment is less

c)   Money does not have to be set aside every month as charges.

3.14.2   Choice of Payment - Non Domestic Sector

In the case of the non-domestic sector, the preference is more in the form of annual or half yearly payment in almost all the cities except in Bhubaneswar where the preference was for monthly payment as shown below :

Choice of Payment by Non-domestic Sector

DESCRIPTION unit sample\ size	SURAT	RAIPUR	SOLAPUR	BHUB.	VIZAG	DELHI	LUCK.	MADRAS
Preference in freq. of billing.	-	-	-	-	-	-	-	-
a) Monthly (%)	6.0	10.0	6.6	70.0	2.8	29.5	7.5	8.6
b) Bimonthly	-	-	8.3	-	5.7	-	2.5	-
c) Quarterly	-	1.0	-	5.0	-	2.7	7.5	1.9
d) Half yearly	4.0	10.0	8.3	20.0	14.3	11.6	20.0	55.2
e) Yearly	20.0	70.0	16.7	5.0	77.1	46.4	35.0	22.0

Source : ORG Survey, 1995.

PART B
SANITATION

3.15   **Introduction**

Water Supply and Sanitation are the two sides of the same coin. Yet sanitation is generally a neglected service in comparison to water supply. In this part of the chapter, the characteristic features of sanitation are presented in terms of :

(a)   Level of sanitation

(b)   Expenditure by hhs on the service - municipal and non-municipal

(c)   Preferences for improvement of the service.

3.16   **Domestic Sector- hhs with Sanitation Service**

A considerable percentage of hhs have reported having sanitation service in all the eight cities. The percentage of hhs with sanitation service has increased with increase in the income level. It may be recalled that in the earlier Chapter of this volume it has been indicated that the level of education increases as the income level increases (Table 24). Similarly, the percentage of hhs with sanitation service is higher in higher income levels. This is due to two reasons : a) They can afford better facilities at higher incomes, b) greater awareness of the importance of sanitation service.

3.17   **Type of Sanitation**

Sanitation Services are of different types such as Septic tank connected to UGD, a stand alone type of Septic tank and low cost sanitation service (LCS). These different types of sanitation facilities are discussed in the following paragraphs.

3.17.1   **Direct Sewerage Connection**

It is seen that most of the hhs (92%) in Madras have reported having this method of sanitation in the greater than 6000 income range, followed closely by Surat. The service is poor in case of Raipur and

Vizag where only 5 and 11 percent of the hhs respectively have connected their sanitation facility to the UGD (Table 25).

3.17.2 Connecting Septic Tank to UGD

There appears to be an indifference on the part of the hhs to connect the septic tanks to the UGD system. This unusual trend points out a few facts:

(a) Less awareness of the advantages of the UGD form of sanitation.

(b) Poor realisation of the importance of the level of sanitation.

(c) Belief in the older (even if poorer) System of Sanitation due to the conventional attitude of the people (Table 26).

3.17.3 Septic Tank

The concept of individual, public and shared septic tanks is a very popular phenomenon. Cities where the UGD has not existed or catered to a limited clientele or area, the concept of septic tank exists. In this connection, Vizag where limited area is covered by the UGD, septic tank is the most popular (nearly 85%) followed by Raipur (63%) (Table 27).

3.17.4 Low Cost Sanitation

Since this facility involves a low cost, there is an evidence of lower income groups expressing a higher preference for the same (for e. g. Lucknow). However, this is, by no means, the same in all the cities (Tabe-28).

3.17.5 Non Domestic Sector-Level of Sanitation

The level of sanitation service in the industrial sector generally follows the same trend as in the hhs sector. A high percentage of industries in Surat, Lucknow, Solapur and Delhi prefer sanitation facility directly connected to UGD. The trend deflects for Madras, where only 17.5% of the industries prefer the UGD system. The high percentage of

responses in the cities to go for sanitation facility connected to UGD system is a morale booster for the public authorities in planning/ expansion of the service. Sanitation by septic tanks only, is largely preferred in Raipur, Bhubaneswar and Madras. In Vizag too about 46 percent of industries prefer it. In these cities the industries are still adhering to the conventional method of sanitation. They do not show an eagerness to take advantage of the UGD facility. The details of the sanitation level of the industries are as follows :

Sanitation Facility Non-Domestic Users

Description	Surat	Raipur	Solapur	Bhuba-neshwar	Vizag	Delhi	Luck	Madras
Sanitation facility directly connected to UGD (%)	76	25	78	10	17	76	62	17.5
Septic tank connected to UGD (%)	4	10	11	-	34	8	1	12.5
Septic tanks (%)	12	95	11	90	46	11	32	60
Low Cost Sanitation	-	-	-	-	-	-	-	10
Others	8	-	-	-	3	5	.50	-

Source : ORG Survey, 1995.

3.17.6 Municipal Expenditure on the Service

In most of the cities, overhauling of the sewerage system is necessary. This could be done if adequate funds are available with the agencies providing the service. Usually, the funds are collected by charging for sewerage connections, collecting user charge and through taxes.

3.18 Expenditure on Municipal Sewerage Service

An attempt has been made to assess the extent of expenditure incurred by the hhs on the Municipal service in terms of taxes and user charges and also the extent of expenditure incurred by the hhs in installation and maintenance of the non-municipal service.

a)   **Sewerage Connection Charge** : The highest sewerage connection charge (Rs. 2600) is paid by the hhs of Solapur in

the income range of Rs.1500. Probably, in view of the high charge, a very low percentage of hhs have sanitation services in Solapur. The hhs in Madras also pay an average charge of Rs.1780. In Surat hhs pay the least (Rs.215) in the income range of 3001-4500. Visakhapatnam is an unusual case since the hhs pay no separate connection charge. (Table 29).

b)   **Sewerage Tax** : The Sewerage Tax is paid at an average of Rs.32 in Surat. Solapur collects the highest sewerage tax (Rs.180). The reason for not showing the sewerage tax in Bhubaneswar and Vizag is that it is not levied separately (Table 30).

c)   **Sewerage Charge** : The collection of sewerage charges in the cities is not uniform. While in some cities it is not separately charged but collected along with the water charge, in some cities, it is separately collected. Among cities Delhi, Madras, Lucknow and Solapur, the Sewerage charges paid by the hhs are the highest in the case of Delhi followed by Solapur, Madras and Lucknow. Table 31 Points out the sewerage charges being paid by the hhs as reflected through the Survey.

d)   **Sewerage Charges- Non-domestic Sector** : It has been observed that Solapur pays the highest sewerage charge of around Rs.13,000 per month. It is also gratifying to note that although the hh Sector of Surat, Raipur and Bhubaneswar do not pay any charges, the situation is reversed in the industrial sector. In Surat, this category of users pay an average of Rs.5200 per month. The details of the Sewerage service in the non-domestic sector are shown below :

Sewerage Charge - Non-domestic Sector (Rs./month per industrial unit)

Surat	Raipur	Solapur	Bhubaneshwar	Vizag	Delhi	Lucknow	Madras
5266	200	13333	105	0	265	67	1099

Source : ORG Survey, 1995.

e) **Years of Existence of the Service** : A cursory glance at Table 32 confirms the following :

(a) Highest percentage of hhs in Surat, Raipur and Bhubaneswar have sanitation services which are around 25 - 35 years old.

(b) In Delhi, Lucknow and Madras, a high percentage has sanitation services for the past 15 years.

3.18.1 Non-Municipal Expenditure

Since the spread of the UGD facility throughout the city is a highly capital intensive proposition, quite a few cities had met gone for it. In view of the partial spread of the facility, HHs have been constrained to invest in private facilities which also involves maintenance of the same. An attempt is made to highlight the extent of non-municipal private expenditures in installing and maintaining the sewerage service.

a) **Capital Investment on Septic Tank** : The general trend is that higher the income range, the greater is capital investment made on the septic tank. The highest capital investment of Rs. 6745 lies in the > 6000 income range in Raipur. The lowest capital investment was by the hhs of Solapur (Table 33).

b) **Maintenance Cost On Septic Tank** : For non municipal facilities of sanitation services, the hhs themselves have to maintain the facilities. The expenditure on the same, as observed, is the highest in Madras at Rs. 87 per year in the > 6000 income range. The hhs of Surat find the septic tank maintenance as the least expensive since they pay only Rs. 14 per year (Table 34).

c) **Age of Septic-Tank** : In Solapur, 95 percent of the hhs have reported to have been using the toilets connected to septic tank since around 13 years and in the rest of the cities with more than 16 years.(Table 35).

d) **First Preference for Improvement in Toilets** : It is observed that in all the cities the first preference for improvement is individual sewerage in all income ranges. Lucknow is an exception in that, the hhs in the income range of < 1500 prefer to have the public toilets improved first. The preference for improvement of non-domestic sewerage comes as no surprise since the users want better sewerage facility and have expressed their need to improve individual sewerage first ; public toilets and LCS later (Table 36).

e) **Second Preference for Improvement in Toilets** : As observed, most of the hhs rank public toilets as the second preference for improvement. Although, the hhs in the income level of Rs.1500-3000 of Delhi and 3001-4500 and > 6000 income range of Solapur prefer improvement of the LCS. The hhs in the < 1500 income range of Lucknow preferred public toilets to be improved first followed by sewerage improvement (Table 37).

TABLES RELATED TO CHAPTER III
PART A : WATER SUPPLY

DESCRIPTION Unit\ Sample Sz	SURAT 430	RAIPUR 216	SOLAPUR 268	BHUBANES 215	VIZAG 300	DELHI 857	LUCKNOW 552	MADRAS 648
1.0 HHs WITH MUNICIPAL WATER CONNEC								
(% to subtot) <=1500 (% hh)	60.9	58.0	43.4	0.0	42.5	64.2	13.4	31.4
1501-3000 (% hh)	78.6	55.7	58.0	77.6	52.0	82.4	51.4	55.9
3001-4500 (% hh)	90.6	54.5	37.5	85.7	67.3	85.9	86.7	74.6
4501-6000 (% hh)	77.3	83.3	87.5	71.9	69.2	88.7	83.3	79.8
> 6000 (% hh)	42.9	86.7	96.0	82.1	62.1	94.7	90.6	76.0
TOTAL (% hh)	72.3	65.7	56.3	79.0	55.7	86.7	71.7	57.3
2.0 HHs HAVING MUN INDIV W SUPPLY								
(% to subtot) <=1500 (% hh)	39.7	24.0	43.4	0.0	32.9	52.2	3.0	3.6
1501-3000 (% hh)	43.7	36.1	49.4	75.5	41.2	65.3	33.3	10.6
3001-4500 (% hh)	52.6	42.4	37.5	83.3	51.0	73.2	64.0	26.8
4501-6000 (% hh)	34.9	71.4	75.0	73.3	59.0	78.1	58.8	29.3
> 6000 (% hh)	19.0	76.7	84.0	79.5	56.8	84.3	46.6	36.9
TOTAL (% hh)	40.0	46.8	51.5	77.7	45.0	74.1	43.7	17.0
3.0 HHs HAVING MUN SHARED W SUPPLY								
(% to subtot) <=1500 (% hh)	3.2	16.0	0.8	-	11.0	4.5	4.5	1.0
1501-3000 (% hh)	2.2	8.2	6.2	-	14.7	8.3	11.4	2.7
3001-4500 (% hh)	1.8	9.1	-	-	16.3	6.3	14.7	2.8
4501-6000 (% hh)	3.5	4.8	8.3	-	7.7	4.0	8.8	5.1
> 6000 (% hh)	4.8	3.3	8.0	-	8.1	2.1	10.5	2.1
TOTAL (% hh)	2.8	8.8	3.7	-	12.3	4.9	10.1	2.5
4.0 HHs HAVING MUN PUBLIC W SUPPLY								
(% to subtot) <=1500 (% hh)	20.6	52.0	29.5	-	41.1	31.3	37.8	21.1
1501-3000 (% hh)	7.1	32.8	24.7	-	18.6	10.2	26.7	9.6
3001-4500 (% hh)	5.3	30.3	18.8	-	16.3	2.8	4.0	2.8
4501-6000 (% hh)	4.7	21.4	4.2	-	7.7	2.0	0.9	3.0
> 6000 (% hh)	-	6.7	-	1.3	5.4	2.1	0.5	7.3
TOTAL (% hh)	7.7	67.0	22.4	0.5	20.7	6.5	11.8	11.0
5.0 PUBLIC SYSTEM : AVG DISTANCE								
<= 1500 (m)	340.9	116.6	319.8	0.0	67.9	206.5	107.1	94.0
1501-3000 (m)	77.0	84.5	270.6	50.0	73.3	210.0	137.8	100.0
3001-4500 (m)	107.1	83.3	311.1	0.0	50.0	64.3	125.0	94.4
4501-6000 (m)	60.0	133.3	466.7	0.0	50.0	180.0	335.7	110.0
> 6000 (m)	50.0	50.0	700.0	50.0	75.0	168.8	407.0	59.1
TOTAL (m)	80.5	100.5	311.4	50.0	67.0	186.8	150.8	94.7
6.0 PUBLIC SYSTEM : AVG COLLEC TIME								
<= 1500 (hrs)	0.7	0.9	1.7	0.0	0.7	1.4	1.0	0.9
1501-3000 (hrs)	0.6	0.8	1.6	0.3	0.8	1.0	1.5	1.0
3001-4500 (hrs)	1.1	0.7	1.4	0.0	0.7	0.3	1.5	1.8
4501-6000 (hrs)	1.1	0.6	1.9	0.0	1.2	0.4	1.6	1.0
> 6000 (hrs)	0.4	1.0	1.5	0.8	0.9	0.8	1.7	0.4
TOTAL (hrs)	0.8	0.8	1.6	0.5	0.8	1.0	1.3	0.9

7.0	PERCENTAGE OF HOUSEHOLDS SHARING									
	<= 1500	(% hh)	9.4	16.0	2.5	0.0	15.1	6.0	14.9	18.5
	1501-3000	(% hh)	17.3	14.7	6.2	2.0	21.6	12.0	14.2	25.5
	3001-4500	(% hh)	13.2	27.3	0.0	0.0	20.4	9.2	18.7	28.1
	4501-6000	(% hh)	14.8	7.1	8.3	4.4	12.8	6.6	11.4	26.3
	> 6000	(% hh)	15.8	10.0	8.0	1.3	13.5	2.9	19.2	16.7
	TOTAL	(% hh)	14.9	14.8	4.5	1.9	17.7	6.9	16.1	22.5
8.0	AVERAGE AGE OF W CONN BY YRS									
	1-5 YRS	(%hh)	12.4	13.8	40.5	13.3	19.9	21.8	12.5	16.6
	6-10 YRS	(%hh)	13.4	30.1	18.9	27.1	24.0	25.1	20.2	18.0
	11-20YRS	(%hh)	21.0	29.3	16.2	27.7	42.7	30.5	31.9	32.0
	21-40 YRS	(%hh)	23.2	21.1	16.9	31.3	11.0	20.1	22.7	23.2
	41-50 YRS	(%hh)	13.1	3.3	4.1	0.6	1.8	2.0	3.7	5.9
	>50 YRS	(%hh)	16.9	2.4	3.4	0.0	0.6	0.5	1.0	4.3
9.0	AVG TIME TO GET NEW CONN BY DAYS									
	1-15 Days	(%hh)	96.7	75.7	91.0	39.3	67.6	97.6	98.7	89.0
	16-30 Days	(%hh)	3.3	22.9	6.3	0.0	14.7	1.2	1.3	8.4
	31-45 Days	(%hh)	0.0	1.4	2.7	0.0	17.7	1.2	0.0	2.6
	45-60 Days	(%hh)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	>60 Days	(%hh)	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0
10	AVG HOURS OF MUN SUPPLY BY HRS									
	<=0.5	(%hh)	10.4	15.4	24.8	3.6	12.7	2.4	4.4	8.1
	0.6-1.0	(%hh)	21.4	23.6	14.8	13.2	46.2	4.0	2.6	25.3
	1.0-2.0	(%hh)	57.2	17.1	37.6	40.7	28.9	13.8	2.1	27.8
	2.0-4.0	(%hh)	9.8	24.4	12.1	40.7	11.0	24.3	24.6	23.2
	4.0-6.0	(%hh)	0.0	13.8	8.7	1.8	0.6	20.1	44.3	5.9
	>6.0	(%hh)	1.1	5.7	2.0	0.0	0.6	35.4	22.0	9.7
11	SATISFIED WITH MUN WATER SUPPLY									
	(% to subtot) <=1500	(% hh)	68.6	14.0	24.6	0.0	49.1	35.8	3.0	25.8
	1501-3000	(% hh)	55.9	13.1	22.1	59.2	46.1	43.0	14.3	32.4
	3001-4500	(% hh)	44.4	15.1	18.8	21.4	49.0	38.0	24.0	40.8
	4501-6000	(% hh)	61.9	9.5	41.7	51.1	56.4	45.0	21.9	47.5
	> 6000	(% hh)	58.3	40.0	40.0	43.6	62.1	35.9	14.1	53.1
	TOTAL	(% hh)	57.1	16.6	29.5	54.0	48.7	39.7	15.8	36.7
12	MAX PROBLEM FACED FOR MUN WS									
	<= 1500	(Name)	Inad sup	Ls pres	Ls pres	Ls pres	Ls pres	Ls S in S	Ls pr/Ls S	Ls S in S
	1501-3000	(Name)	Inad sup	Ls pres	Ls pres	Ls pr/In s	Od Tm/In S	Ls S in S	Ls pres	Inad sup
	3001-4500	(Name)	Inad sup	Ls S in S	Ls pres	Ls pres	Ls pres	Ls S in S	Ls pres	Odd Tmg
	4501-6000	(Name)	Others	Ls pres	Ls pres	Ls pres	Ls pres	Ls S in S	Ls pres	Odd Tmg
	> 6000	(Name)	Inad sup	Ls pres	Ls pres	Ls pres	Ls pres	Ls pres	Ls pres	Ls S in S
	TOTAL	(Name)	Inad sup	Ls pres	Ls pres	Ls pres	Ls pres	Ls S in S	Ls pres	Odd Tmg

Inad sup — Inadequate supply
Ls Pres — Less Pressure
Odd Tmg — Odd Timings
Ls s in s — Less supply in summer

13	TOT MUN WATER USED IN SUMMER/DAY								
	<= 1500	(LPCD)	139	83	75	-	74	52	52	45
	1501-3000	(LPCD)	127	84	78	88	66	59	72	55
	3001-4500	(LPCD)	132	108	74	87	65	69	68	58
	4501-6000	(LPCD)	130	95	81	90	80	71	85	67
	> 6000	(LPCD)	119	113	72	99	81	80	102	66
	TOTAL	(LPCD)	131	94	77	93	70	69	83	56

14	MUNICIPAL EXPEND : WATER TAX								
	<= 1500	(Rs/yr)	35.9	201.5	395.0	-	Rs. 480/yr	0.0	5.8	238.0
	1501-3000	(Rs/yr)	36.0	195.9	165.0	-		525.0	59.3	284.7
	3001-4500	(Rs/yr)	38.4	283.8	275.0	-		89.6	110.2	286.5
	4501-6000	(Rs/yr)	36.2	284.7	207.5	-		282.6	114.6	310.0
	> 6000	(Rs/yr)	41.8	405.5	322.0	-		68.9	245.7	225.6
	TOTAL	(Rs/yr)	37.1	284.1	284.8	-		153.5	135.6	291.3

15	WATER CONNEC CHARGE (1 time)								
	<= 1500	(Rs)	2500.0	2970.0	1703.8	0.0	2876.0	1273.9	437.5	2321.7
	1501-3000	(Rs)	911.7	2309.5	1432.7	284.2	2972.4	1443.4	761.2	3301.2
	3001-4500	(Rs)	1630.0	3515.0	1775.0	274.9	3033.3	1594.2	779.9	3408.3
	4501-6000	(Rs)	600.0	2194.4	2131.2	320.6	3150.0	1746.8	862.1	4359.4
	> 6000	(Rs)	500.0	1810.0	1212.5	420.0	3818.8	1349.4	1779.4	3346.7
	TOTAL	(Rs)	1156.4	2535.2	1626.8	341.1	3100.6	1477.5	1255.7	3395.7

16	WATER CHARGE								
	<= 1500	(Rs/yr)	52.7	-	433.2	-	493.7	373.7	10.6	362.8
	1501-3000	(Rs/yr)	64.8	-	447.5	284.2	467.0	323.2	140.2	299.6
	3001-4500	(Rs/yr)	78.0	-	383.3	274.9	481.8	371.4	241.2	336.3
	4501-6000	(Rs/yr)	74.0	195.0	533.3	320.6	270.8	333.8	316.3	324.9
	> 6000	(Rs/yr)	59.5	-	361.4	420.0	263.6	416.0	263.0	309.0
	TOTAL	(Rs/yr)	67.6	195.0	287.1	341.1	574.7	370.4	217.0	321.6

17	NON-MUNICIPAL EXPEND : AVG CAP								
	<= 1500	(Rs)	3159.0	2886.0	8000.0	18000.0	3918.2	3570.0	1075.0	4940.0
	1501-3000	(Rs)	2097.0	6043.0	9167.0	8900.0	4450.0	2827.1	1400.0	5910.2
	3001-4500	(Rs)	1954.4	2683.3	9500.0	7250.0	4126.2	2854.2	3374.0	6913.2
	4501-6000	(Rs)	2414.4	4214.0	12000.0	4153.0	5154.0	2691.0	3084.0	3342.1
	> 6000	(Rs)	3301.0	3631.0	7429.0	6728.0	7327.0	4326.0	4450.0	12023.0
	TOTAL	(Rs)	2471.0	4171.1	8523.0	8265.0	4870.0	3479.0	3648.4	5702.0

18	AVERAGE MAINTENENCE								
	<= 1500	(Rs/yr)	0.0	25.0	300.0	150.0	170.0	72.0	90.0	57.3
	1501-3000	(Rs/yr)	103.0	92.0	188.0	68.0	85.4	61.0	28.0	83.2
	3001-4500	(Rs/yr)	87.0	181.3	100.0	58.3	53.0	39.0	38.1	76.0
	4501-6000	(Rs/yr)	140.0	141.0	500.0	53.2	86.0	40.0	67.1	73.0
	> 6000	(Rs/yr)	100.0	135.0	250.0	59.2	83.0	48.2	62.0	73.1
	TOTAL	(Rs/yr)	107.4	92.0	229.0	61.0	84.1	116.1	56.3	75.5

19	EXPND ON PRIVATE PURCHASE								
	<= 1500	(Rs/yr)	380.0	137.5	430.0	0.0	240.0	100.0	0.0	1561.8
	1501-3000	(Rs/yr)	365.0	122.8	245.0	0.0	240.0	217.3	450.0	459.6
	3001-4500	(Rs/yr)	50.0	135.0	250.0	248.3	0.0	200.0	0.0	887.1
	4501-6000	(Rs/yr)	301.0	167.3	0.0	158.3	0.0	344.3	0.0	1231.3
	> 6000	(Rs/yr)	350.0	66.7	93.3	355.0	0.0	364.3	330.0	916.2
	TOTAL	(Rs/yr)	309.6	124.1	238.6	264.0	240.0	298.8	354.0	1031.2

20	OPINION ON CHARGES : HIGH									
	(% to subtot) <=1500	(% hh)	24.2	56.1	63.7	0.0	46.2	15.9	33.3	32.6
	1501-3000	(% hh)	17.0	45.8	56.3	16.2	60.8	21.8	24.2	52.8
	3001-4500	(% hh)	27.9	40.0	60.0	11.4	53.1	22.9	10.8	61.9
	4501-6000	(% hh)	20.0	56.2	59.1	14.7	38.5	20.0	20.4	52.5
	> 6000	(% hh)	29.1	53.3	60.0	19.4	35.1	16.9	17.9	46.9
	TOTAL	(% hh)	21.2	50.5	60.4	16.1	61.8	19.5	19.2	49.8

21	HIGH MUN CHARGE BY REASON									
	(% to subtot) <=1500	(Name)	RESN-2356	RESN-5	RESN-5	RESN-0	RESN-5	RESN-5	RESN-5	RESN-5
	1501-3000	(Name)	RESN-5	RESN-5	RESN-5	RESN-5	RESN-3	RESN-5	RESN-5	RESN-5
	3001-4500	(Name)	RESN-5	RESN-5	RESN-5	RESN-3	RESN-5	RESN-5	RESN-5	RESN-5
	4501-6000	(Name)	RESN-6	RESN-5	RESN-5	RESN-3	RESN-5	RESN-5	RESN-5	RESN-5
	> 6000	(Name)	RESN-3	RESN-5	RESN-9	RESN-3	RESN-5	RESN-5	RESN-5	RESN-5
	TOTAL	(Name)	RESN-3	RESN-5	RESN-5	RESN-3	RESN-5	RESN-5	RESN-5	RESN-5

Reason 2-   Less Income so Charge is high
Reason 3-   Quantity of water is not sufficient
Reason 5-   Compared to the quantity of water, charges are high
Reason 6-   Even if there is no municipal connection, water tax has to be paid

22	1st PREFERENCE FOR IMPROV									
	<= 1500	(Nm/%hh)	H CN 92.1	PU T 38.0	H CN 36.1	PRES 0.0	QUAN 13.7	QN-HC 23.9	PU T 61.2	H CN 57.7
	1501-3000	(Nm/%hh)	H CN 92.6	HC-PR 29.5	H CN 33.3	PRES 40.8	PRES 21.6	PRES 27.8	H CN 42.9	H CN 54.8
	3001-4500	(Nm/%hh)	H CN 89.1	QUAL 33.3	H CN 43.8	PRES 50.0	PRES 32.7	PRES 38.0	PRES 40.0	H CN 45.1
	4501-6000	(Nm/%hh)	H CN 93.6	PRES 45.2	PRES 41.6	PRES 35.5	QN-HC 23.0	PRES 30.5	PRES 43.9	H CN 45.5
	> 6000	(Nm/%hh)	H CN 94.3	PRES 43.3	PRES 44.0	PRES 37.2	QUAN 24.3	PRES 39.5	PRES 47.1	H CN 45.8
	TOTAL	(Nm/%hh)	H CN 92.4	PRES 31.9	H CN 32.1	PRES 40.0	QN-PR 20.0	PRES 32.9	PRES 36.6	H CN 51.9

H CN   House Connection
PU T   Public Tap
QUAL   Quality
QUAN   Quantity
PRES   Pressure

23	CHOICE OF PAYMENT FOR WS / SW									
	<= 1500	(Name)	YEARLY	YEARLY	YEARLY	YEARLY	YEARLY	MTHLY	H YRLY	YEARLY
	1501-3000	(Name)	YEARLY	YEARLY	YEARLY	H YRLY	H YRLY	MTHLY	YEARLY	H YRLY
	3001-4500	(Name)	YEARLY	YEARLY	YEARLY	H YRLY	H YRLY	MTHLY	H YRLY	H YRLY
	4501-6000	(Name)	YEARLY	YEARLY	YEARLY	H YRLY	H YRLY	MTHLY	YEARLY	H YRLY
	> 6000	(Name)	YEARLY	YEARLY	MTHLY	H YRLY	H YRLY	YEARLY	YEARLY	H YRLY
	TOTAL	(Name)	YEARLY	YEARLY	YEARLY	H YRLY	H YRLY	MTHLY	H YRLY	H YRLY

H YRLY   Half Yearly
MTHLY   Monthly

P A R T   B : S A N I T A T I O N

24	TOTAL HH WITH SANIT SERVICE									
	(% to subtot) <=1500	(% hh)	96.9	56.0	54.1	100.0	78.1	71.6	16.5	95.8
	1501-3000	(% hh)	97.3	67.2	76.5	93.9	94.1	86.6	81.5	98.4
	3001-4500	(% hh)	98.2	90.9	81.3	97.6	93.9	97.1	98.7	95.7
	4501-6000	(% hh)	98.8	90.5	87.7	100.0	100.0	99.9	97.4	100.0
	> 6000	(% hh)	100.0	83.3	92.0	100.0	89.2	98.6	98.9	99.0
	TOTAL	(% hh)	97.0	74.5	68.6	98.1	90.3	93.4	85.3	97.7

25	LEV OF SANIT : DIRECT TO UGD									
	(% to subtot) <=1500	(% hh)	65.6	2.0	41.8	0.0	0.0	40.3	7.5	85.6
	1501-3000	(% hh)	72.1	4.9	56.8	42.9	4.2	46.3	38.1	78.7
	3001-4500	(% hh)	75.4	12.1	43.8	42.9	1.9	61.3	64.0	84.5
	4501-6000	(% hh)	81.0	2.4	66.7	53.3	0.0	61.5	71.9	89.9
	> 6000	(% hh)	69.0	3.3	80.0	57.7	0.0	66.9	69.6	91.7
	TOTAL	(% hh)	73.0	4.6	52.2	50.2	10.6	57.8	55.8	85.6
26	SEPTIC TANK TO UGD									
	(% to subtot) <=1500	(% hh)	4.7	0.0	0.0	0.0	4.2	0.0	0.0	1.0
	1501-3000	(% hh)	6.0	1.6	1.2	14.3	2.8	4.2	1.9	2.1
	3001-4500	(% hh)	5.3	0.0	0.0	9.5	6.4	4.2	1.3	5.6
	4501-6000	(% hh)	1.2	0.0	4.2	2.2	12.2	10.6	0.9	1.0
	> 6000	(% hh)	2.4	0.0	0.0	11.5	14.3	15.3	4.7	3.1
	TOTAL	(% hh)	4.4	0.5	0.4	9.8	6.3	8.6	2.3	2.2
27	SEPTIC TANK									
	(% to subtot) <=1500	(% hh)	28.1	46.0	12.3	100.0	73.2	17.9	1.5	7.2
	1501-3000	(% hh)	22.4	52.5	18.5	36.7	89.6	23.1	19.0	16.5
	3001-4500	(% hh)	17.5	72.7	37.5	45.2	91.5	24.6	22.7	5.6
	4501-6000	(% hh)	16.7	83.3	16.8	44.4	87.8	22.5	15.8	8.1
	> 6000	(% hh)	35.7	73.3	12.0	30.8	80.0	14.6	23.0	4.2
	TOTAL	(% hh)	23.0	63.0	16.0	38.1	84.7	20.1	18.1	9.4
28	LOW COST									
	(% to subtot) <=1500	(% hh)	4.7	6.0	0.0	0.0	12.7	13.4	7.5	0.0
	1501-3000	(% hh)	0.0	8.2	0.0	0.0	6.6	13.0	22.9	1.1
	3001-4500	(% hh)	0.0	6.1	0.0	0.0	2.1	7.0	10.7	0.0
	4501-6000	(% hh)	0.0	4.8	0.0	0.0	0.0	5.3	8.8	1.0
	> 6000	(% hh)	0.0	6.7	0.0	0.0	2.9	1.8	1.6	0.0
	TOTAL	(% hh)	0.7	6.5	0.0	0.0	6.0	6.9	9.1	0.5
29	MUNI EXPEND : SEW CONNEC CHARGE									
	(% to subtot) <=1500	(Rs)	0.0	0.0	1350.0	0.0	0.0	312.5	0.0	1500.3
	1501-3000	(Rs)	0.0	2000.0	1454.5	854.0	0.0	589.1	644.6	1912.5
	3001-4500	(Rs)	215.0	800.0	1620.0	691.7	0.0	1110.0	581.5	3000.0
	4501-6000	(Rs)	850.0	0.0	2600.0	803.3	0.0	531.0	658.2	566.7
	> 6000	(Rs)	0.0	0.0	2200.0	1025.0	0.0	650.4	734.3	2171.4
	TOTAL	(Rs)	638.0	1200.0	1738.5	901.7	0.0	657.0	688.6	1778.4
30	SEWERAGE TAX									
	(% to subtot) <=1500	(Rs/yr)	27.1	0.0	150.0	0.0	0.0	0.0	28.0	93.7
	1501-3000	(Rs/yr)	29.9	72.0	80.0	0.0	0.0	180.0	37.3	228.1
	3001-4500	(Rs/yr)	30.5	0.0	166.7	0.0	0.0	140.0	40.4	205.3
	4501-6000	(Rs/yr)	29.1	0.0	399.7	0.0	0.0	142.5	53.4	162.4
	> 6000	(Rs/yr)	52.2	0.0	0.0	0.0	0.0	140.0	51.5	147.5
	TOTAL	(Rs/yr)	31.9	0.0	180.4	0.0	0.0	150.6	48.1	176.0
31	SEWERAGE CHARGE									
	(% to subtot) <=1500	(Rs/yr)	0.0	0.0	77.5	0.0	0.0	0.0	24.7	21.7
	1501-3000	(Rs/yr)	0.0	0.0	45.0	0.0	0.0	86.3	24.8	55.0
	3001-4500	(Rs/yr)	0.0	0.0	50.0	0.0	0.0	79.4	27.2	37.5
	4501-6000	(Rs/yr)	0.0	0.0	25.0	0.0	0.0	95.2	32.6	38.3
	> 6000	(Rs/yr)	0.0	0.0	15.0	0.0	0.0	80.8	33.3	42.5
	TOTAL	(Rs/yr)	0.0	0.0	48.1	0.0	0.0	82.5	31.0	42.4

#	Category		C1	C2	C3	C4	C5	C6	C7	C8
32	AVG YRS OF EXISTENCE SANIT SERVI									
	1-5 YRS	(%hh)	14.2	5.9	27.9	11.1	50.0	17.3	10.5	18.5
	6-10 YRS	(%hh)	22.6	8.9	19.3	21.1	16.7	25.9	32.1	16.3
	11-20 YRS	(%hh)	19.9	29.7	15.2	26.3	33.3	31.8	34.3	33.5
	21-40 YRS	(%hh)	25.7	32.2	16.2	33.9	0.0	21.8	18.5	21.9
	41-50 YRS	(%hh)	8.7	8.9	9.1	2.9	0.0	2.6	2.9	6.6
	>50 YRS	(%hh)	11.5	14.4	12.3	4.7	0.0	0.6	1.7	3.2
33	NON MUNI : AVG CAP SEPTIC TANK									
	(% to subtot) <=1500	(Rs)	2709.0	4369.1	2500.0	3500.0	2413.5	2687.5	2000.0	3392.3
	1501-3000	(Rs)	2150.0	5627.1	2000.0	3166.6	3415.5	4153.6	3271.4	3206.9
	3001-4500	(Rs)	2100.0	3659.9	1940.0	3237.5	2743.8	4203.1	3252.9	5250.0
	4501-6000	(Rs)	1692.0	5282.3	1500.0	3316.7	3097.3	3963.9	4452.9	2462.5
	> 6000	(Rs)	2720.0	6745.3	2500.0	3116.7	3094.4	4038.9	3773.3	4500.0
	TOTAL	(Rs)	2242.0	5742.8	2046.2	3208.3	3017.4	4018.1	3678.2	3375.9
34	AVG MAINTENANCE : SEPTIC TANK									
	(% to subtot) <=1500	(Rs/yr)	0.0	-	50.0	50.0	31.1	60.1	90.0	63.8
	1501-3000	(Rs/yr)	0.0	-	82.3	49.4	42.2	53.6	62.3	80.9
	3001-4500	(Rs/yr)	10.0	-	70.0	50.1	30.4	56.9	64.6	69.7
	4501-6000	(Rs/yr)	10.0	-	0.0	37.5	38.4	49.9	66.5	74.6
	> 6000	(Rs/yr)	16.6	-	62.5	43.3	32.2	49.2	69.9	87.3
	TOTAL	(Rs/yr)	14.0	-	69.4	45.0	36.2	48.7	67.2	73.3
35	AVG YRS OF EXISTENCE SEPTIC TANK									
	1-5 YRS	(%hh)	-	0.0	0.0	12.0	0.0	2.0	0.0	0.0
	6-10 YRS	(%hh)	-	5.0	0.0	4.8	5.3	6.1	0.0	0.0
	11-15 YRS	(%hh)	-	95.0	0.0	3.6	2.0	7.5	1.1	0.0
	>=16 YRS	(%hh)	-	0.0	100.0	79.6	92.7	84.3	98.9	100.0
36	1st PREF FOR IMPROV IN TOILET									
	(% to subtot) <=1500	(Nm-% hh)	IS-82.5	IS-52.0	IS-60.7	IS-100.0	IS-65.8	IS-67.2	PT-58.2	IS-84.5
	1501-3000	(Nm-% hh)	IS-84.0	IS-65.6	IS-54.3	IS-100.0	IS-90.2	IS-75.9	IS-84.8	IS-92.0
	3001-4500	(Nm-% hh)	IS-90.6	IS-75.8	IS-68.8	IS-100.0	IS-89.8	IS-82.4	IS-97.3	IS-94.4
	4501-6000	(Nm-% hh)	IS-96.1	IS-83.3	IS-66.7	IS-100.0	IS-100.0	IS-82.8	IS-97.4	IS-93.9
	> 6000	(Nm-% hh)	IS-100.0	IS-60.0	IS-80.0	IS-100.0	IS-92.0	IS-75.1	IS-99.5	IS-89.6
	TOTAL	(Nm-% hh)	IS-88.3	IS-66.7	IS-61.6	IS-100.0	IS-85.7	IS-77.2	IS-88.6	IS-90.0
37	2nd PREF FOR IMPROV IN TOILET									
	(% to subtot) <=1500	(Nm-% hh)	PT-17.5	PT-42.0	PT-13.1	0.0	PT-21.9	PT-20.9	IS-38.8	PT-16.0
	1501-3000	(Nm-% hh)	PT-16.0	PT-31.1	PT-21.0	0.0	PT- 5.9	LC- 9.3	PT-11.4	PT- 7.4
	3001-4500	(Nm-% hh)	PT- 9.4	PT-12.1	LC- 6.3	0.0	PT- 8.2	PT- 5.6	PT- 2.7	PT- 4.2
	4501-6000	(Nm-% hh)	PT- 3.9	PT-11.9	PT-16.7	0.0	0.0	PT- 5.3	PT- 1.8	PT- 5.1
	> 6000	(Nm-% hh)	0.0	PT-26.7	LC-12.0	0.0	PT- 5.4	PT- 1.8	PT- 0.5	PT- 9.4
	TOTAL	(Nm-% hh)	PT-11.7	PT-26.4	PT-13.8	0.0	PT- 9.3	PT- 6.2	PT-10.1	PT- 9.6

IS   Individual Sewerage
PT   Public Toilet
Source : ORG Survey, 1995.

CHAPTER - IV

WILLINGNESS - TO - PAY

CHAPTER IV
WILLINGNESS TO PAY (WTP)

4.1   **Introduction**

The level of WTP depends upon the reliability of the service (timings, quality, etc.) and the quantity. These qualitative and quantitative aspects play a crucial role in the HH's decisions. In this connection, an attempt is made in the present chapter to ascertain the WTP of the HHs for the WS/ SW services. The chapter is divided into part A and part B presenting the analysis on water supply and Sanitation Services respectively.

PART - A

4.2   **Water Supply**

Improvements could be brought about in the WS/SW services only if adequate funds are available. These funds for the sector are collected in the form of connection charges (a one-time payment) and user charges (on recurring basis) from the consumers. The issues related to the users' WTP under different conditions of water supply are presented as follows:

4.2.1   **Readiness to Pay for Standpost**

Standposts are generally used by the lower income group of HHs and also by those who do not have public water connections. Standpost is also reported as a supplementary source where the supply is characterised by low pressure. For instance, in Lucknow 94 percent of the HHs in the >Rs 1500 income range have WTP for standpost followed by Raipur with 74 percent in the same income range. The WTP for standpost decreases with the increase in income range. But this is not so in Bhubaneswar 0 cause the public water supply is adequate. It can be stated that the amount the HHs are willing to pay depends upon the level of scarcity. The WTP is upto Rs 225 and 223 per year in the > 6000 income range in Solapur and Surat

respectively. The WTP is least (Rs.60 per year) in Bhubaneswar, where the WS situation is comfortable. (Tables 1 and 2).

4.2.2   **Households with Public Water Connection**

Among all the 8 cities, maximum coverage by the public water supply system has been successfully achieved in Delhi where 86.7 percent of the HHs have reported having a public water connection compared to the sparsely covered city Solapur (56%) followed by Madras (57%), (Table 3)

Efficient maintenance of the system, requires adequate funds on a recurring basis. The flow of these funds is a function of the level of satisfaction of the consumer. Keeping this in view, an attempt has been made to understand the HHs' WTP under two situations :

a)   WTP for the existing level of supply

b)   WTP for the improved supply

It is clear from the records of the agencies dealing with WS service, that the existing user charges are low. The rates charged lie much below the affordability level of the users. Cities where the supply is reasonably good, for instance in Delhi, the HHs appear to have a higher WTP.

4.2.3   **In the Case of HHs**

A.   WTP For Existing Water Supply

The WTP for existing water supply is the highest in Raipur and Lucknow (66 %). In Raipur, nearly 85 percent of HHs are ready to pay more for existing supply in the Rs. 3001-4500 monthly income range and in Lucknow 84.3 in the above Rs. 6000 income range. Since Bhubaneswar has a sound water supply system at present, very few are WTP more for existing supply. The HHs in Vizag and Madras

show least WTP for existing conditions. This is understandable as the water supply system here leaves a lot to be desired and therefore the households feel that it is not worth making additional payments.

Surprisingly, the HHs in Raipur expressed having WTP at Rs 100 per month for existing supply. HHs in Delhi are willing to pay Rs 75 per month. The HHs of Raipur and Delhi are at present paying user charges of only Rs 16 per month and Rs 30 per month respectively. Thus the HHs here can afford to pay much more than what they are paying now. At Rs 33 per month, WTP in Madras ranks the lowest which indicates that the HHs' WTP is less for the existing erratic water supply. Consequently, they are not ready to pay more than Rs 40 per month (Tables 4 & 5).

B. WTP For Improved Water Connections

The WTP for improved water connection is the highest in Delhi followed by Lucknow. In Delhi 73.2 percent and in Lucknow 70.3 percent HHs are WTP for improved water connection. In these two cities, the main problems are of scanty supply in summer and low pressure. These cities characterised by high incomes as revealed by the survey, exhibited high WTP for improved connections. In Surat, a sizeable proportion of HHs (32%) have reported a low WTP for improved connection although the supply is inadequate. In Madras too, HHs are not very willing to pay, although the water supply is not adequate. The HHs are feel that since there is no new source of water more payment is not going to secure them an improved supply.

A look across the 8 cities confirms that as the HHs in Delhi are willing to pay a maximum amount (Rs 73 per month), they also demand a high supply of 106 LPCD. The residents of Solapur demand 101 LPCD although they are not willing to pay more than Rs 45 per month. This discrepancy is explained as follows : In Delhi, the average monthly income of HHs is found to be Rs 6000 so they can afford to

pay more for a better supply. Whereas in Solapur, the average monthly income is Rs 2000, they have low affordability for improved supply. The HHs in general have expressed a WTP to the extent of Rs 37 per month in return for 93 LPCD (Tables 6,7 & 9).

Fixed Charge :

Fixed charge is the one time payment made in order to obtain a Public WS Connection. This charge is generally fixed by the agency supplying water. This charge varies from Rs 1000 to Rs 4000 depending on the availability of water.

The HHs were asked as to how much would they be WTP as a fixed charge for **Improved Water Connection**. It is observed that HHs in Lucknow are WTP an average of Rs 1705 followed by Solapur where the HHs are WTP Rs 1052. It has also been inferred that the fixed charge of the HHs is increasing with the increase in the range of income. In Bhubaneswar, the HHs are WTP the least (Rs. 500) for improved water connection. This might be, as stated earlier, so since the people already have a good supply, and therefore they are not interested to pay higher sums for betterment (Table 8). In this connection, an attempt is also made to ascertain the views of the non-domestic sector.

4.2.4 **In the case of Non-Domestic Sector**

Industries Willing-To-Pay for Improved Connections

Nearly 73 percent of industries in Lucknow are WTP for improved connections followed by Delhi (65 %). This is more or less the same trend observed in the HH sector. Delhi and Lucknow being quite old cities, there is very low percentage of industries/ HH without connections. And they are more or less quite satisfied with the water supply. However, they generally have problems regarding shortages in supply and low pressure. In case these problems are overcome, they are ready to pay for improved supply.

In Lucknow industries are ready to pay upto Rs 5000 as fixed charge and Rs 680 as monthly charges whereas in Delhi they are ready to pay Rs 4000 as fixed charges and Rs 575 as monthly charges. In Bhubaneswar, only 5 percent of the industries are ready to pay Rs 3000 as fixed charge and Rs 550 as monthly charges for improved connections, since they are satisfied with the existing water supply connections as shown below.

WTP for improved connections (Non-domestic sector)

DESCRIPTION	SURAT	RAI-PUR	SOLA-PUR	BHUB	VIZAG	DELHI	LUCK.	MADRAS
WTP One Time Cost for improvement conn. Rs.	14 % 12597	5% 5000	00 00	5 % 3000	37.1 % 20625	65.1% 4108.9	72.5% 5819	18.09% 4421
WTP Annual Main.cost for improvement conn. Rs.	16% 331	5% 1000	00 00	5% 550	34.3% 1931	64.3% 575	75% 680	18.09% 326

Source : ORG Survey, 1995

4.3 Reasons for not getting House Connection

The reasons for not getting house connection is varied among the cities. In Raipur, Madras and Delhi the HHs find the charge is too high. In Madras the water available is very less for the lower income groups. In Solapur which has the least number of public connections, HHs find the ground water good.

4.4 WTP for Improved Pressure

The cities with complaints of low pressure are Lucknow, Vizag, Bhubaneswar, Solapur and Raipur. Among these cities, the HHs in Lucknow (71 %) rank the highest in WTP for improved pressure followed by Bhubaneswar (61 %). However, in these two cities the HHs' WTP is only about Rs 8 per month whereas in Solapur 31 percent of the HHs are WTP around Rs 24 per month for improved pressure (Tables 11 & 12).

4.5 WTP for Improved Qqality of Water

Improved quality of water is something which is desired by all the users although it does not have the top priority in their demand chart.

In Lucknow and Bhubaneswar maximum HHs want improvement in the quality of water. For Bhubaneswar the implications are that although water supply is comfortable, the quality is not recommendable. On glancing at the amount the HHs are WTP, it is clear that 29 percent of HHs in Solapur are WTP Rs 19 per month on an average. In rest of the cities, no one is prepared to pay more than Rs 10 per month. In most of the cities WTP has registered an increase with the increase in the income level. (Tables 13 & 14)

4.6   **WTP for Improved Supply of Water**

HHs in Surat, Delhi, and Madras complained of inadequate supply/ low pressure in summer. And yet it is the HHs in Lucknow (70 %) who have expressed WTP for improved supply followed by Bhubaneswar. In Madras very few HHs are ready to pay for improved supply. The HHs in Madras are aware of the fact that there are supply constraints and hence this realisation makes them unwilling to pay any more even with promises of improved supply. It is indeed encouraging to note that, although Solapur HHs have the lowest monthly income of Rs 2000, the HHs are ready to pay the more for improved pressure and improved quality which is higher than HHs in other cities. If the supply pressure and quality of water are improved, probably more people would be encouraged to have public water supply connections (Tables 15 & 16).

4.7   **WTP for New Connection**

It has been observed that the city of Delhi is covered to the maximum by the public water connections followed by Bhubaneswar and Surat. The minimum number of connections was found in Solapur. And yet the WTP for new connections does not complement the above fact. In Solapur, the WTP for new connection is 28 percent. This is coupled with their willingness to pay a standard amount for all improvements in water supply, encouraging the public agency to invest more for improvements in the water supply sector. In

Bhubaneswar only 4 percent HHs are WTP for new connections because most of the HHs in this city, are satisfied with the existing service. In Solapur HHs expect an average supply of 91 LPCD. In Delhi the HHs expect 110 LPCD followed by Lucknow at 99 LPCD. Although Delhi expects a higher LPCD average, the HHs are willing to pay only Rs 970 on an average as fixed charge whereas in Vizag HHs are ready to pay up to Rs 1350 for 65 LPCD as fixed charge. This is because the amount of water supplied in Vizag is generally on a lower side. In Bhubaneswar, the HHs are ready to pay a fixed charge up to Rs 1250 Whereas in Madras HHs are WTP Rs 1160 for 74 LPCD.

On comparison with Table 16 it could be inferred that the HHs in Bhubaneswar are willing to pay 3.5 times the standard rate for a new connection. They are also WTP an average of Rs 31 as monthly charge. This is so because the connection users feel that more money could get them a connection faster. In Bhubaneswar it takes upto two months to get a new connection as observed earlier. The HHs in Vizag are ready to pay the highest amount of Rs 41 as monthly charges whereas the HHs of Madras are WTP Rs 24 per month.(Tables 17,18,19 & 20)

4.8 Willingness to have New Connections - Non-Domestic Ssector

In Madras, nearly 46 percent of the industries would like to have new connections. The least number of new connections is required by Vizag (8.6 %). Although in the domestic sector Surat ranks second at 23 percent, only 18 percent of the industries in Surat wish to have new connection. This is probably because the industries are least satisfied with the existing connections.

The high demand for new connections in Madras is because :

a)   Bore/ tube well does not yield water of a specified quality due to flouride content and Salination.

b)   Private purchase proves to be too expensive in the long run.

Although in Vizag only 8.6 percent want new connection they are ready to pay an average amount of Rs 51,000 as fixed charges. Industries in Surat too are ready to pay up to Rs 22,500. As far as the monthly water charge is concerned, similar to HH sector, Vizag is ready to pay a high charge of Rs 5,033 per month.

WTP for new connections - Non-domestic sector

DESCRIPTION	SURAT	RAI-PUR	SOLA-PUR	BHUB.	VIZAG	DELHI	LUCK.	MADRAS
Percentage of ind. who wish to have new connection	18	20	0	20	8.6	32	30	45
WTP Conn. charge for new conn. (Avg. per Industry) (in Rs.)	22525	4125	0	1120	51000	2294	3708	5312
WTP Water charge (Avg. per Industry) (In Rs.)	2509	2048	0	482	5033	670	366	57

Source : ORG Survey 1995

It can thus be inferred that, people are willing to pay for better conditions of water supply. The willingness is not only need based but also depends on the status of the user. The charges also vary from city to city depending on the prevailing rates. Broadly speaking, it could be concluded that WTP depends on the following factors :

a)   Affordability of user

b)   prevailing rates of municipal supply

c)   Existing conditions (pressure, quality, quantity, etc.)

d)   Awareness among HHs for potable water

e)   Satisfaction level of users

PART B -
SANITATION

4.9   **WTP for Sanitation**

As already reported, not many of the HHs in all the 8 cities are covered by sanitation facilities. An attempt is made in this part of the chapter to assess the possibility of the extent of HHs willing to pay more for existing/improved facilities and amount that could be collected as fixed charges and monthly charges from the people.

4.9.1   **WTP more for Existing Sewerage Connection**

WTP for existing facilities is directly proportional to the satisfaction rate. In Lucknow about 70 percent of the HHs are willing to pay more for existing sewerage connections followed by Bhubaneswar at 56 percent. This brings out two aspects :

a)   HHs are satisfied with the existing sewerage system.

b)   HHs can afford to pay more for existing facilities.

In Madras, more number of HHs opt in favour of better sanitation facilities.

When it comes to paying monthly charges for the existing connections, Solapur ranks the highest and is WTP Rs 57 per month, (Table 21 & 22). This trend of high WTP in Solapur was noticed in the WS sector also which could be probably due to two reasons:

a)   The beginning of the HUDCO project in Solapur which has instilled confidence that the facility would soon improve the situation and also

b)   the project has created an awareness for better facilities in the WS & SW. Sector

4.9.2   **WTP more for Improved Connections**

WTP for improved connection is always more for existing ones. The HHs in Lucknow followed by Bhubaneswar are still the maximum for

those who are WTP more for improved connections. The percentage of HHs is also nearly the same in Surat which ranks third (52 %). This percentage of HHs is 1.5 times more than the people willing to pay more for improved water supply. The reasons for this are as follows:

a) The SW service in Surat is in a very bad condition

b) The rains of 1994 followed by the plague and the consequent scare have made the people take stock of their existing SW facilities.

c) The threat of a repeat episode of plague has made them to aspire for better SW facilities.

In Surat people are willing to pay an average fixed charge of Rs.640. The higher income groups are willing to pay even up to Rs 1315 which is the highest in all the 8 cities. The HHs in Solapur are ready to pay a fixed charge of Rs 730 and an average monthly charges of Rs 31, Surat is ready to pay an average monthly charge of only Rs 16, (Tables 23,24 & 25).

| 4.9.3 | **WTP for Improved Sewerage Connection - Non Domestic Sector** |

WTP for Improved Sewerage Connection - Non Domestic Sector
The WTP for improved sewerage connection is generally on the poorer side. As high as 59 percent of the industries in Delhi and 42.5 percent in Lucknow are willing to pay to the extent of Rs 2700 and Rs 3135 respectively as fixed charges. Considerable percentage (17 %) of industries in Vizag would like to pay for improved connection, a fixed charge of Rs 14,250. In the case of Surat, 12 percent of the industries are WTP a fixed charge of Rs 10,700 as shown in the following table. In terms of monthly charges, the industries are willing to pay anywhere between Rs 150 - 380 as monthly charges. These charges are quite high when compared with the HH sector because the industries include the overheads as part of their ex-factory price..

Industry : Willingness To Pay for the SW Service

Sr. No.	DESCRIPTION	SURAT	RAI PUR	SOLA PUR	BHUB.	VIZAG	DELHI	LUCK.	MADRAS
1	a) WTP one time cost	12 %	-	-	15 %	17 %	59 %	42 %	14 %
	b) Improvement Rs.	10700	-	-	4267	14250	2697	3135.3	4479
2	a) WTP Annual Maint.Cost	10 %	-	-	15 %	11 %	63 %	72%	11 %
	b) Improvement S.C. Rs.	117	-	-	117	200	381	259	16

Source : ORG Survey, 1995.

4.10   **HHs that wish to have Individual Municipal Sewerage Connection**
More than half of the HHs in Raipur and Solapur wish to have an individual sewerage connection. A large proportion of the HHs in the Rs 1500 income range might be having shared connection, more percentage of people in this range wish to have individual connections. This category of HHs wish to have individual connections. The amount the HHs are prepared to part with widely varies. In Raipur people are ready to pay an average of Rs 1090 as fixed charge towards individual connections. In Bhubaneswar they are willing to pay the least amount (Rs. 304) among all 8 cities (Tables 26 & 29).

As far as monthly charge is concerned, HHs in Bhubaneswar are ready to pay the highest charge of Rs.41 and HHs in Raipur lag far behind (Rs 19). This difference exists due to the wide gap in the average monthly incomes of the HHs. The average monthly income of HHs in Bhubaneswar is two times that of Raipur (Table 30).

4.11   **WTP For Adequate Sewerage Connection (Industry)**
Above 57 % of industries in Lucknow and 30 % in Delhi are willing to pay for adequate SW connection. As far as the fixed charge and monthly charge are concerned, the trend again shows a change. In Madras, the WTP a fixed charge of Rs 5000 and Vizag about Rs 4300. In the case of the Delhi, a monthly charge of Rs 780 and Surat Rs 300 has been the WTP. Thus it has been observed that adequate sewerage connection is not a dire necessity in Madras and yet

industries are willing to pay highly for adequate facilities. The industries in Surat have higher WTP to pay monthly charges for sewerage facilities, although willingness was quite negligible in the HH sector. The following table reveals the WTP of the Industries.

WTP - New SW Connection (Non-Domestic Sector)

Sr.No.	DESCRIPTION	SURAT	RAIPUR	SOLAPUR	BHUB.	VIZAG	DELHI	LUCK.	MADRAS
1	Willingness to take adequate sewer line conn.	12 %	5 %	-	10 %	8.6 %	30.4 %	57.5 %	11.4 %
2	WTP one time fixed charge	3383	1000	-	1400	4333.3	2285.3	2739.1	5000
3	Sewerage user charge (month)	312.5	100	-	100	112.5	782.7	200	270

Source : ORG Survey, 1995.

4.12 Reason why HHs do not want Individual Connections

In most of the cities the reason why HHs do not wish to have individual sewerage connection is that they find the internal arrangements are good enough and satisfactory. In Raipur and Bhubaneswar they find the Municipal SW connection as a costly one, and hence they prefer shared connections. In the lower income groups people are not ready for individual connections (Tables 27 & 28)

(a) First Reason for not getting Sewer connection by Non-domestic Sector

A high percentage of responses in Surat, Raipur and Bhubaneswar say that they do not need a sewer connection since the internal arrangements are adequate. Bhubaneswar and Madras have expressed different views. In Madras, the respondents feel that the Municipal sewerage charge is high as shown in the following table, whereas in Bhubaneswar the reason has not been named.

Industry : First Reason For Not Getting SW Connection

Sr.No.	DESCRIPTION	SURAT	RAIPUR	SOLAPUR	BHUB.	VIZAG	DELHI	LUCK.	MADRAS
1	First reason for not getting S.C.	Internal	Internal	Internal	Others	Internal	Internal	Internal	M.Sw
2	Percentage	70	60	16.7	65	20	21.4	2.5	-

Internal = Internal Arrangements Are Well Adequate
MSW = Municipal Sewerage Connection Cost Is High
Source : ORG Survey 1995.

TABLES RELATED TO CHAPTER IV
P A R T   A :   W A T E R   S U P P L Y

DESCRIPTION / Unit\ Sample Sz		SURAT 430	RAIPUR 216	SOLAPUR 268	BHUBANES 215	VIZAG 300	DELHI 857	LUCKNOW 552	MADRAS 648
1.0 **READINESS TO PAY FOR STANDPOST**									
(% to subtot) <=1500	(% hh)	37.5	74.0	38.5	0.0	35.6	25.4	94.0	73.1
1501-3000	(% hh)	23.0	67.2	40.7	2.0	29.4	36.1	67.6	47.8
3001-4500	(% hh)	22.8	63.6	37.5	2.4	20.4	38.7	29.3	36.6
4501-6000	(% hh)	13.1	71.4	16.7	0.0	15.4	25.2	37.7	38.4
> 6000	(% hh)	16.7	70.0	• 16.0	0.0	21.6	20.3	34.0	28.1
TOTAL	(% hh)	22.5	69.4	35.1	0.9	26.7	28.6	47.8	49.8
2.0 **WTP FOR STANDPOST**									
(% to subtot) <=1500	(Rs/yr)	102.5	126.5	137.9	0.0	85.3	120.0	104.8	90.4
1501-3000	(Rs/yr)	148.6	155.1	180.0	60.0	147.6	122.4	105.6	111.3
3001-4500	(Rs/yr)	101.5	188.6	190.0	60.0	138.0	163.2	141.8	87.7
4501-6000	(Rs/yr)	114.5	198.0	180.0	0.0	200.4	169.2	132.5	120.0
> 6000	(Rs/yr)	222.9	168.6	225.0	0.0	120.0	188.4	139.4	120.0
TOTAL	(Rs/yr)	131.1	163.2	161.5	60.0	127.2	154.0	121.1	102.0
3.0 **HH WITH MUN WATER CONNEC**									
(% to subtot) <=1500	(% hh)	60.9	58.0	43.4	0.0	42.5	64.2	13.4	31.4
1501-3000	(% hh)	78.6	55.7	58.0	77.6	52.0	82.4	51.4	55.9
3001-4500	(% hh)	90.6	54.5	37.5	85.7	67.3	85.9	86.7	74.6
4501-6000	(% hh)	77.3	83.3	87.5	71.9	69.2	88.7	83.3	79.8
> 6000	(% hh)	42.9	86.7	96.0	82.1	62.1	94.7	90.6	76.0
TOTAL	(% hh)	72.3	65.7	56.3	79.0	55.7	86.7	71.7	57.3
4.0 **HH READY TO PAY M FOR EXIST WS**									
(% to subtot) <=1500	(% hh)	31.2	42.0	41.8		0.0	8.1	11.9	1.0
1501-3000	(% hh)	40.4	49.2	50.6	2.0	0.9	9.6	51.4	3.2
3001-4500	(% hh)	59.6	84.8	25.0	2.4	3.6	11.2	76.0	0.0
4501-6000	(% hh)	53.6	83.3	70.8	2.2	2.4	13.9	77.2	5.1
> 6000	(% hh)	31.0	100.0	84.0	7.7	0.0	27.3	84.3	6.3
TOTAL	(% hh)	43.3	66.7	50.0	4.2	1.3	16.2	66.7	2.9
5.0 **WTP MORE FOR EXIST LEV WS**									
(% to subtot) <=1500	(Rs/m)	38.3	100.0	61.2		0.0	30.0	26.9	25.0
1501-3000	(Rs/m)	38.0	0.0	70.0	25.0	100.0	48.1	30.3	25.0
3001-4500	(Rs/m)	40.3	100.0	55.0	100.0	90.0	71.1	38.0	0.0
4501-6000	(Rs/m)	48.4	100.0	66.8	100.0	100.0	36.2	39.2	55.0
> 6000	(Rs/m)	57.7	100.0	74.3	100.0	0.0	86.5	40.1	25.0
TOTAL	(Rs/m)	42.3	100.0	66.5	91.7	95.0	74.8	41.1	32.9
6.0 **HH READY TP FOR IMPROVE W CONN**									
(% to subtot) <=1500	(% hh)	25.0	16.0	36.1	0.0	16.1	52.2	7.5	19.6
1501-3000	(% hh)	28.7	21.3	46.1	48.9	27.5	67.9	51.0	41.5
3001-4500	(% hh)	54.4	18.2	25.0	59.5	51.0	73.9	84.0	60.6
4501-6000	(% hh)	39.3	35.7	75.0	55.5	48.7	73.5	82.5	63.6
> 6000	(% hh)	14.3	43.3	64.0	60.3	40.5	82.2	90.5	51.0
TOTAL	(% hh)	32.1	25.5	44.8	56.3	33.0	73.2	70.3	41.8

7.0	AVERAGE LPCD									
	(% to subtot) <=1500	(LPCD)	64.0	66.0	101.0	0.0	68.0	91.0	66.0	51.0
	1501-3000	(LPCD)	57.0	77.0	102.0	50.0	77.0	98.0	81.0	102.0
	3001-4500	(LPCD)	62.0	75.0	85.0	52.0	67.0	106.0	75.0	51.0
	4501-6000	(LPCD)	62.0	69.0	90.0	50.0	93.0	103.0	81.0	58.0
	> 6000	(LPCD)	70.0	71.0	116.0	51.0	72.0	115.0	110.0	57.0
	TOTAL	(LPCD)	61.0	72.0	101.0	51.0	76.0	106.0	93.0	56.0
8.0	WTP M FOR IMPROV WATER CONNEC FIXED CHARGE :									
	(% to subtot) <=1500	(Rs)	666.7	875.0	835.2	0.0	833.3	535.7	850.0	1032.9
	1501-3000	(Rs)	622.4	538.4	960.5	500.0	803.6	551.7	938.7	1039.5
	3001-4500	(Rs)	660.3	583.3	875.0	500.0	720.0	638.1	1210.3	548.8
	4501-6000	(Rs)	750.0	616.7	1513.9	500.0	907.8	668.9	1476.1	603.2
	> 6000	(Rs)	1166.7	673.1	1390.6	500.0	866.7	1146.1	2270.2	673.5
	TOTAL	(Rs)	697.4	645.5	1052.1	500.0	815.7	805.0	1705.5	600.2
9.0	ADD MONTHLY CHARGE									
	(% to subtot) <=1500	(Rs/m)	24.0	25.6	30.6	0.0	20.4	20.5	22.0	24.7
	1501-3000	(Rs/m)	17.8	15.0	32.8	21.2	19.6	24.2	27.9	26.7
	3001-4500	(Rs/m)	20.0	15.0	23.3	15.0	20.2	23.2	32.1	30.2
	4501-6000	(Rs/m)	20.3	17.0	43.4	31.3	23.7	27.2	34.4	30.2
	> 6000	(Rs/m)	27.5	16.5	40.0	37.3	22.7	36.0	45.1	31.9
	TOTAL	(Rs/m)	20.0	17.5	34.2	28.1	20.9	28.6	37.8	28.7
10	REASONS FOR NOT GETTING H.C.									
	(% to subtot) <=1500	(Name)	Oth	Ch Hi	Ch Hi	GrW Gd	PS Gd	Ch Hi	PS Gd	Ch Hi
	1501-3000	(Name)	Oth	Ch Hi	Ch Hi	a/b/c/d	PS Gd	a/e	PS Gd	Oth
	3001-4500	(Name)	Oth	MS Unre	GrW Gd	MS Unre	a/b/e	Oth	GrW Gd	a/b
	4501-6000	(Name)	Oth	PS Gd	Ch Hi	GrW Gd	GrW Gd	Oth	b/e	PS Gd
	> 6000	(Name)	Oth	a/b/c/e	Oth	MS Unre	GrW Gd	Oth	GrW Gd	Ch Hi
	TOTAL	(Name)	Oth	Ch Hi	GrW Gd	MS Unre	PS Gd	Ch Hi	PS Gd	Ch Hi

a)	Ch Hi	Municipal Water Charges are High
b)	PS Gd	Public System is Good and Sufficient
c)	MS Unre	Municipal Supply is Unreliable and Insufficient
d)	GrW Gd	Ground Water Potential is Good
e)	Oth	Others

11	WTP FOR IMPROV PRESSURE									
	(% to subtot) <=1500	(% hh)	21.9	18.0	23.8	0.0	13.7	32.8	9.0	10.3
	1501-3000	(% hh)	33.9	9.8	32.1	57.1	28.4	53.6	51.4	29.2
	3001-4500	(% hh)	63.9	33.3	18.8	57.1	31.0	60.6	84.0	42.2
	4501-6000	(% hh)	47.6	61.9	50.0	60.0	46.2	63.6	82.5	42.4
	> 6000	(% hh)	31.0	63.3	52.0	67.9	40.5	63.7	90.6	38.5
	TOTAL	(% hh)	37.9	37.5	31.0	61.4	32.3	59.5	70.7	28.4

12	WTP FOR IMPROV PRESSURE								
	(% to subtot) <=1500	(Rs/m)	7.1	7.2	17.8	0.0	7.0	5.5	10.0	8.0
	1501-3000	(Rs/m)	8.9	7.5	25.4	5.7	6.6	6.8	9.8	8.8
	3001-4500	(Rs/m)	8.6	10.5	28.3	5.4	7.4	9.4	11.0	10.0
	4501-6000	(Rs/m)	12.8	9.2	29.2	6.9	7.8	6.9	12.7	9.3
	> 6000	(Rs/m)	21.9	7.6	29.6	8.6	6.3	13.6	16.7	12.8
	TOTAL	(Rs/m)	10.8	8.5	24.0	7.0	7.3	9.8	8.3	9.8
13	WTP FOR IMPROV QUALITY OF W								
	(% to subtot) <=1500	(% hh)	15.6	16.0	20.5	0.0	13.7	19.4	9.0	9.8
	1501-3000	(% hh)	23.5	21.3	30.9	57.1	28.4	38.4	51.4	28.7
	3001-4500	(% hh)	50.9	27.2	18.8	57.1	51.0	47.2	84.0	45.0
	4501-6000	(% hh)	36.9	54.8	50.0	60.0	48.7	55.0	81.6	41.4
	> 6000	(% hh)	28.6	56.7	48.0	67.9	37.8	64.4	90.5	37.5
	TOTAL	(% hh)	29.1	32.4	28.7	61.4	32.3	49.8	70.5	28.1
14	WTP FOR IMPROV QUALITY OF W								
	(% to subtot) <=1500	(Rs/m)	6.0	10.0	11.0	0.0	6.0	5.0	6.7	6.1
	1501-3000	(Rs/m)	7.3	5.8	19.4	5.7	7.1	7.5	7.8	9.6
	3001-4500	(Rs/m)	7.1	9.4	31.7	5.0	7.8	6.2	8.3	10.9
	4501-6000	(Rs/m)	9.4	11.1	27.5	6.5	7.6	8.5	7.9	9.1
	> 6000	(Rs/m)	15.0	6.8	24.2	7.6	5.7	13.5	12.0	13.1
	TOTAL	(Rs/m)	8.4	8.7	19.2	6.5	7.1	10.2	9.8	10.1
15	WTP FOR IMPROV SUPPLY OF WATER								
	(% to subtot) <=1500	(% hh)	26.6	16.0	20.5	0.0	13.7	34.3	9.0	9.8
	1501-3000	(% hh)	31.1	27.9	30.9	57.1	27.5	52.8	51.4	27.1
	3001-4500	(% hh)	59.6	27.3	18.8	57.1	51.0	57.0	84.0	39.4
	4501-6000	(% hh)	45.2	52.4	50.0	60.0	48.7	59.6	80.7	39.4
	> 6000	(% hh)	33.3	60.0	48.0	67.9	37.8	65.8	90.6	35.4
	TOTAL	(% hh)	38.8	34.3	28.7	61.4	32.0	57.5	70.3	26.4
16	WTP FOR IMPROV SUPPLY OF WATER								
	(% to subtot) <=1500	(Rs/m)	6.8	10.0	14.2	0.0	9.0	6.7	5.0	6.1
	1501-3000	(Rs/m)	9.6	7.9	24.2	5.0	7.5	7.5	7.2	7.7
	3001-4500	(Rs/m)	8.8	11.7	31.7	5.0	6.2	8.0	7.2	9.3
	4501-6000	(Rs/m)	13.4	12.3	30.8	5.4	7.6	7.4	7.6	8.6
	> 6000	(Rs/m)	23.6	6.1	29.2	5.8	7.1	12.6	11.4	11.4
	TOTAL	(Rs/m)	11.0	9.5	23.1	5.4	7.3	9.5	9.1	8.7
17	READINESS TO PAY FOR NEW CONNEC								
	(% to subtot) <=1500	(% hh)	29.7	20.0	36.1	0.0	11.0	19.4	34.3	13.9
	1501-3000	(% hh)	19.6	11.5	27.2	4.1	8.6	6.0	31.4	17.0
	3001-4500	(% hh)	10.7	15.2	31.3	2.4	2.2	6.3	12.0	8.5
	4501-6000	(% hh)	23.8	7.1	16.7	6.6	5.6	5.3	15.8	9.1
	> 6000	(% hh)	35.7	13.3	0.0	2.6	5.4	3.6	6.8	9.4
	TOTAL	(% hh)	22.6	13.4	28.0	3.7	7.0	6.2	17.4	12.8

18	AVERAGE LPCD									
	(% to subtot) <=1500	(LPCD)	71.0	79.0	103.0	0.0	65.0	88.0	83.0	70.0
	1501-3000	(LPCD)	62.0	63.0	68.0	50.0	65.0	103.0	106.0	77.0
	3001-4500	(LPCD)	60.0	78.0	104.0	50.0	50.0	146.0	84.0	93.0
	4501-6000	(LPCD)	67.0	90.0	65.0	77.0	85.0	125.0	103.0	83.0
	> 6000	(LPCD)	83.0	50.0	0.0	70.0	50.0	104.0	113.0	57.0
	TOTAL	(LPCD)	69.0	72.0	91.0	71.0	65.0	110.0	99.0	74.0
19	AVERAGE FIXED CHARGE : NEW CONNE									
	(% to subtot) <=1500	(Rs)	789.5	925.0	863.6	0.0	1062.5	596.1	521.7	1060.0
	1501-3000	(Rs)	854.2	1000.0	1204.5	1250.0	1625.0	673.1	954.5	1093.8
	3001-4500	(Rs)	666.6	1600.0	1150.0	2000.0	2000.0	1083.3	1056.0	2000.0
	4501-6000	(Rs)	1037.5	1000.0	1375.0	2000.0	2000.0	650.0	1361.1	1777.8
	> 6000	(Rs)	1983.3	875.0	0.0	500.0	500.0	2000.0	2115.4	500.0
	TOTAL	(Rs)	1044.2	1060.0	1010.0	1250.0	1325.0	969.4	1093.8	1160.5
20	AVG MONTHLY CHRGE : NEW CONNEC									
	(% to subtot) <=1500	(Rs/m)	20.0	17.2	21.9	0.0	15.0	16.5	15.9	21.5
	1501-3000	(Rs/m)	37.0	15.0	24.7	47.5	40.0	24.1	22.8	24.1
	3001-4500	(Rs/m)	15.0	15.0	27.0	47.5	80.0	33.3	28.3	21.0
	4501-6000	(Rs/m)	20.5	15.0	26.7	15.0	80.0	18.8	28.9	36.3
	> 6000	(Rs/m)	29.3	15.0	0.0	15.0	15.0	30.0	31.5	25.6
	TOTAL	(Rs/m)	21.2	15.7	23.2	31.3	41.0	24.1	24.0	24.4

PART B   SANITATION

21	WTP more for EXIST SEW. CONN.									
	(% to subtot) <=1500	(% hh)	87.5	2.0	23.8	0.0	4.0	26.9	36.0	28.0
	1501-3000	(% hh)	51.4	3.3	30.0	49.0	7.0	33.2	56.2	54.0
	3001-4500	(% hh)	59.6	24.2	25.0	50.0	8.0	38.2	77.3	66.2
	4501-6000	(% hh)	51.2	4.7	50.0	56.0	10.0	35.1	82.0	77.0
	> 6000	(% hh)	38.0	0.0	76.0	65.0	31.0	54.8	79.0	71.0
	TOTAL	(% hh)	49.0	6.0	33.6	55.8	8.0	43.9	70.0	54.0
22	WTP Av monthly charge for EXIST									
	(% to subtot) <=1500	(AvRs/m)	25.0	20.0	46.0	0.0	6.7	22.5	14.0	17.0
	1501-3000	(AvRs/m)	27.2	40.0	71.0	28.3	27.1	36.0	21.0	13.4
	3001-4500	(AvRs/m)	28.8	39.4	62.5	38.3	42.5	47.6	29.0	12.0
	4501-6000	(AvRs/m)	35.2	30.0	48.0	38.0	38.0	75.0	31.0	17.0
	> 6000	(AvRs/m)	55.6	36.5	61.0	39.2	46.0	67.3	35.0	11.0
	TOTAL	(AvRs/m)	31.0	36.5	57.3	36.6	37.0	53.4	30.0	14.0
23	WTP more for IMPROV									
	(% to subtot) <=1500	(% hh)	34.4	0.0	16.0	0.0	4.1	10.4	34.3	9.3
	1501-3000	(% hh)	47.5	3.3	21.0	48.0	6.0	18.1	56.3	22.3
	3001-4500	(% hh)	64.5	6.1	19.0	45.0	6.1	25.4	79.0	29.6
	4501-6000	(% hh)	63.1	0.0	42.0	56.0	12.8	26.5	81.0	31.3
	> 6000	(% hh)	59.5	0.0	40.0	64.0	30.5	28.8	76.4	44.4
	TOTAL	(% hh)	52.0	1.9	21.0	54.9	7.3	23.7	69.0	22.3

24	Addl 1 time fix chrg									
	(% to subtot) <=1500	(Rs)	331.8	0.0	643.3	0.0	566.6	150.0	189.0	202.8
	1501-3000	(Rs)	450.0	750.0	677.0	479.0	258.3	555.6	511.4	292.3
	3001-4500	(Rs)	597.3	200.0	600.0	400.0	267.0	320.8	529.1	292.0
	4501-6000	(Rs)	788.7	0.0	930.0	473.0	280.0	234.0	524.4	319.6
	> 6000	(Rs)	1315.0	0.0	790.0	484.2	970.0	544.5	982.1	377.3
	TOTAL	(Rs)	640.0	475.0	730.0	469.3	268.2	432.2	679.0	304.7
25	Addl Monthly chrg									
	(% to subtot) <=1500	(Rs/m)	11.2	0.0	26.4	0.0	21.7	10.6	15.0	11.2
	1501-3000	(Rs/m)	13.9	15.0	27.4	23.3	10.0	16.1	18.0	14.5
	3001-4500	(Rs/m)	13.7	30.0	28.3	28.0	10.0	16.1	17.0	18.6
	4501-6000	(Rs/m)	18.0	0.0	29.0	30.0	10.0	17.1	19.0	16.6
	> 6000	(Rs/m)	27.0	0.0	44.0	28.0	11.0	24.0	24.0	16.9
	TOTAL	(Rs/m)	16.0	22.5	31.3	27.3	11.7	19.3	20.0	15.7
26	HHs that wish IND MUN Sw CONN									
	(% to subtot) <=1500	(% hh)	37.5	58.0	46.0	0.0	22.0	50.7	52.0	54.0
	1501-3000	(% hh)	26.8	44.3	47.0	27.0	38.2	55.1	45.0	34.0
	3001-4500	(% hh)	21.1	51.5	50.0	22.0	43.0	41.5	42.0	24.0
	4501-6000	(% hh)	21.4	57.1	33.3	16.3	49.0	33.1	23.3	16.2
	> 6000	(% hh)	28.6	46.7	20.0	17.0	48.0	22.1	31.0	7.3
	TOTAL	(% hh)	26.7	51.4	43.0	19.0	36.3	37.8	37.0	32.3
27	If NO, then the 1st REASON									
	<=1500	(Name)	E & S	N T F	C C H	M M P	E & S	N T F	E & S	E & S
	1501-3000	(Name)	E & S	E & S	C C H	C C H	E & S	E & S	E & S	E & S
	3001-4500	(Name)	E & S	E & S	C C H	C C H	E & S	E & S	E & S	E & S
	4501-6000	(Name)	OTHERS	E & S	E & S	C C H	E & S	E & S	E & S	E & S
	> 6000	(Name)	E & S	E & S	CCH/E&S	C C H	E & S	E & S	E & S	E & S
	TOTAL	(Name)	E & S	E & S	C C H	C C H	E & S	E & S	E & S	E & S

E&S — Enough and Satisfactory
NTF — No Toilet Facility
CCH — Connection Charge High
MMP — Municipal Maintenance is Poor

28	If NO, then the 1st REASON									
	<=1500	(%hh)	100.0	45.4	56.3	100.0	36.0	40.0	44.0	67.4
	1501-3000	(%hh)	100.0	48.5	40.0	50.0	52.0	45.3	56.0	94.0
	3001-4500	(%hh)	100.0	64.3	66.6	67.0	58.0	60.0	61.2	94.4
	4501-6000	(%hh)	66.6	72.2	80.0	39.0	74.0	45.7	52.0	100.0
	> 6000	(%hh)	100.0	60.0	80.0	36.4	67.0	57.1	54.2	100.0
	TOTAL	(%hh)		53.0	49.2	47.0	52.0	51.3	52.1	91.0

29	if YES WTP Av CONN CHRG 1 time									
	(% to subtot) <=1500	(Rs)	729.1	1137.9	893.0	0.0	338.0	708.3	527.0	898.0
	1501-3000	(Rs)	833.3	923.1	1054.0	327.0	290.0	918.0	771.0	879.0
	3001-4500	(Rs)	863.6	1000.0	1062.0	328.0	279.0	1093.2	896.0	833.3
	4501-6000	(Rs)	1068.2	1250.0	1063.0	917.0	333.0	1084.9	1105.0	833.3
	> 6000	(Rs)	1363.6	1107.1	1200.0	296.0	343.0	1000.0	1650.0	938.0
	TOTAL	(Rs)	955.8	1086.3	982.4	304.0	309.0	968.6	1061.0	739.2

30	If YES, WTP Av MONTHLY CHRG									
	(% to subtot) <=1500	(Rs/m)	10.0	17.4	20.1	0.0	20.6	15.4	14.9	14.7
	1501-3000	(Rs/m)	12.3	15.8	30.1	38.6	25.5	17.5	18.8	20.5
	3001-4500	(Rs/m)	10.0	24.1	39.4	35.5	32.4	17.4	24.0	15.0
	4501-6000	(Rs/m)	20.8	20.8	20.6	51.6	37.2	17.3	28.7	74.3
	> 6000	(Rs/m)	18.6	22.5	46.0	41.9	37.5	19.4	28.0	22.9
	TOTAL	(Rs/m)	14.0	19.4	25.9	41.0	29.6	17.6	23.2	21.7

Source : ORG Survey, 1995.

CHAPTER - V

ROLE OF CAPITAL MARKET
IN INFRASTRUCTURE INVESTMENT

CHAPTER V

ROLE OF CAPITAL MARKET IN INFRASTRUCTURE INVESTMENT

5.1 Introduction

The purpose of this chapter is to present the views of the no-domestic and domestic users to invest in equity/debenture/bonds. The chapter focuses on the issues related to the gaps in infrastructure, the role of debt instruments and the response of the consumers for investment in the capital market.

The urban authorities, today are in a low level equilibrium trap. The low level of resources for urban infrastructure result in low level of services leading to low willingness to pay for these and hence low cost recovery. Infrastructure investments tend to be lumpy in nature, have a long life and a stream of benefits necessitate the access of authorities to long term resources for finance. These long term resources were limited to intergovernmental transfers. But the two main constraints associated with this relate to :

a) inadequate resources due to classification of urban investment as social needs rather than economic services.

b) uncertainty of resource availability for local authorities.

Another issue is related to the inadequacy of current income of local authorities to meet debt servicing and maintenance and operation needs. This requires significant tariff revisions and management improvements in tax and tariff collections.

5.2 Gaps in Infrastructure Levels/ Investment

This aspect has been discussed under two heads such as :

a) level of service provision

b) infrastructure investments

a) **level of service provision** : There are serious shortfalls in the service levels in India as brought about by many studies. For example, the NIUA (1989) study (carried out in 159 urban centers) clearly highlights the situation whereby almost one fourth of the population does not have access to water supply and 18% of the population has less than 50 LPCD water. Similar problems exist in sanitation too. Mehta and Mehta (1992) identify that only 20% of waste water generated in Class-I cities is actually collected for treatment in only 48 out of the 212 Class-I cities.

Based on some recent attempts at estimating infrastructure investment requirements, it is derived that during the period ranging from 1991 to 1996, the annual requirements range from about Rs.3000 to 6500 crores to take care of the backlog as well as the increments to urban population depending on the levels of standards for the provision of services. The World Bank points out that in real terms, the future costs of provision of water are at least 2 to 3 times the current costs.

b) **Infrastructure Investments** : There are two main options for achieving additionality in resources for infrastructure investments. The first option of integrating it with capital markets is shown by the US experience. The advantage is of a greater sense of financial discipline and that the subsidies for urban infrastructure become more transparent and better targeted. The second option is based on European and Japanese experience which puts grater emphasis on channelling the captive funds from insurance and security systems for this sector. In order to attract the investors in capital market for infrastructure investments, it is essential to ensure full cost recovery at commercially viable rates. But in any type of

system, it is unusal for the expenditure on service to be fully covered by user charges. This may be because of substantial wastage in the system, by lower user charges, as a result of, among other things, political pressures and inability to collect charges when levied.

5.3   **Funding through novel methods**

a)   **Debt Instruments** : The existing level of debt market in India is so low that it becomes necessary to have intermediate finance systems which will link the infrastructure developers and projects to the emerging debt market in the country. This will require concerted efforts. A number of private funds have recently been established to channel international capital for the developing country infrastructure, by pooling the risks across the project. These funds mobilize resources through private placements from institutional investors including pension funds. Contractual savings institutions such as pension funds and life insurance companies are particularly suited to making long term investments. Availability of finance would greatly increase if regulatory and supervisory agencies in industrial countries were to relax the severe restrictions on the share and type of assets that the pension funds and other institutional investors can hold in the capital markets in the developing countries.

b)   **Bonds** : The most commonly used instruments are debentures and bonds. The debentures by private companies have no limits on period or interest rates and can be fixed on the basis of credit rating and market conditions. The public sector companies issue bonds for some of which government has granted tax exemption, e.g., in recent past, HUDCO ; Konkan Railway Finance Corporation

and Indian Railway Finance Corporation have been permitted to issue tax-free bond.

The most important development in the last 4 years has been the flows of long term private capital to developing countries, especially in the form of foreign direct investment and portfolio flows. Infrastructure has been a significant beneficiary of such flows as shown below :

Portfolio and Foreign Direct Investment in Developing Countries, 1990 to 1993.

(US $ In bn)

Sr. No.	Type	1990	%	1991	%	1992	%	1993	%
1.	Foreign equity securities	3.78	10.6	7.55	13.2	13.07	15.5	13.1	11.7
2.	Debt Instruments	5.56	15.0	12.72	22.3	23.73	28.2	42.6	38.0
	a) Bonds	4.68	13.1	10.19	17.8	21.24	25.3	39.1	34.9
1+2	Total portfolio	9.34	26.2	20.30	35.5	36.80	43.8	55.7	49.7
3.	Foreign Direct Investment	26.3	73.8	36.90	65.2	47.30	57.2	56.3	50.3
*	Total	35.64	100.0	57.17	100.0	84.10	100.0	112.0	100

Source : <u>The World Development Report.</u> (The World Bank, Washington, 1994)

It is evident that the rate of increase in foreign equity securities is very low compared to the funds from of debit instruments. The flow from bonds is very high in the total foreign investments in the developing countries. The share of bonds has increased from 13% in 1990 to 50% in 1993.

A possibility concerned with the bond finance is through either the local authorities or the governments themselves participating in these developments or trough private developers. The USA 's experience shows that municipal bonds provided 60% of the total capital expenditure of the state and local governments during the seventies. In industrial countries, bond financing is widely used to raise funds for municipal infrastructure.

It has also stimulated the development of local bond market. Municipal authorities issue bonds directly. They sometimes pool their needs with those of other local governments, particularly, when their borrowing requirements are small or their credit worthiness is poor. For instance, in Columbia, the municipal credit institution has evolved into an autonomous agency that operates under finance ministry. Between 1975 and 1990, over 1300 projects of value more than $ 1 billion were financed, assisting more than 600 municipal bodies. The systems funding does not rely on government budgetary appropriations but rather on bonds, recycling of its loans and foreign credits from bilateral and multilateral sources.

5.4   Institutional Options for Infrastructure Systems

The selection of an appropriate form for provision of given service depends on several factors like the service characteristics, strength of the given local government and organisations representing the consumer groups and   -the capacity of the private sector to take on the responsibilities in partnership arrangements. Some other types of partnership agreements are like BOO (Build Own and Operate),BOT (Build Operate and Transfer), CT (Competitive Tendering); CCT (Compulsory Competitive Tendering); Contracting out Franchising; Concession, Leasing; MBO (Management Buy Out), and so on. The gradually evolving trend towards the use of capital market for infrastructure investment in India has concentrated more on evolving the commercially viable public-private partnerships and mobilizing the resources from capital market. If greater attention is paid to all such critical issues, the infrastructure sector would contribute to the development of debt market in the country and itself also benefit from it. This approach presents the most potential avenue for breaking the low level infrastructure trap. The bond financing for infrastructure financing and the related issues are adds follows :

5.5 Infrastructure develpment by private sector through bond financing in India - some issues

An attempt is made to present the various issues related to the bond financing for the infrstructure development as follows :

Private Infrastructure development through Bond Financing :

1.	For a private investor, municipal bonds have been a source of high returns - in past : they are often tax exempt	Risks are high and market liquidity has often has been low.
2.	Infrastructure companies and projects add to the long term securities on capital market	Still, there is no matching demand for such securities for the market to function well.
3.	Bonds can attract to infrastructure financing a whole new class of investors such as pension funds, and insurance companies, etc. Seeking long term, stable returns.	So far, mostly, short term debt instruments are available in the Indian capital market as against the long term nature of infrastructure investment.
4.	By issuance of the municipal bonds, a good market based bench mark would be made available and it would stimulate the growth of the local bond market.	Municipal bond financing can be a good device to escape budgetary discipline and hence carries the risk that municipalities may borrow excessively and then default, leaving the govt. to pick up the tab.
5.	Creation of debt intensive financing packages for infrastructure projects will help enhance the returns on equity and better presence the shareholder control.	It is difficult to finance the infrastructure projects with their long gestation periods and slow paybacks by issuing equity on the primary markets.

Source : Meera Mehta, "Increasing Infrastructure Finance through Capital Markets", International IHSP Seminar - Integrated Urban Infrastructure Development (February 1-4, 1995) Ch.34.

5.6 The Indian Scenario -response for bond funding in 8 cities

In our country, infrastructure is not yet considered lucrative for private participation. A study across 8 cities has been carried out to have a clear understanding of the way the capital market responds to investments in infrastructure. The analysis is being done on the basis of the following criteria.

a) Economic Base

In the cities surveyed with the exception of Lucknow, about 25 to 45 percent of industries are willing to contribute through debenture or project based bonds, if water supply and sewerage are included. While Lucknow has shown the maximum willingness to invest in infrastructure bonds, Surat has shown the least. It is evident that these bonds are not very popular amongst the industries though there is a positive outlook towards these infrastructure bonds. Because of booming share market and the presence of highly productive industries like textiles, chemicals and diamonds in Surat, where the dividends appear to be much higher, it is understandable that industries' response to government bonds is none too enthusiastic. On the other hand, in the case of Lucknow which is relatively less industrialized, the respons is better for bonds. Similar trend is exhibited by the hh sector.

b) Willingness to Pay

Average Willingness to Pay is the other dimension to the bonds. Generally, it ranges between Rs. 10,000 to 20,000 per industry. But there are also cities like Bhubaneswar and Surat where on an average, industries are ready to pay as high as Rs. 6 lakh and Rs.3 lakhs respectively. Though in Surat a small percentage of industries are ready to pay for bonds, their average WTP is much higher compared to some of the other cities. The households' willingness falls in the range of Rs. 23,000 to Rs. 50,000 for bonds. Citywise analysis shows a willingness as high as Rs. 82,000 and Rs. 95,000 in Visakhapatnam and Bhubaneswar respectively. This readiness for huge investments can be attributed to lack of an alternative and lack of faith in the government operations.

c) Rate of Interest

It has been observed that a higher rate of return is expected by industrial investors as compared to household investors. For example, industries expect between 17 to 19.25 percent interest rate whereas households expect within 16 to 17 percent as shown in the following table. Confidence seems to be an important criterion in investment. The households have shown maximum faith in State Government Bonds, followed by private companies and poorly trailed by bonds of municipal institutions. Although the investors are ready to invest in these bonds, they want security by the State Government Because they have very little faith in the municipal institutions.

Willingness to Invest in Bonds- hhs and non-domestic sector

Sr. No.	Description	Visakhapatnam		Solapur		Raipur		Bhuba-neswar		Lucknow		Surat		Madras	Delhi
		Ind.	HH	Ind.	HH	Ind.	HH	Ind.	HH	Ind.	HH	Ind	HH	HH	HH
1.	% of Sample WTP	35	31	26	35	40	55	46	55	97	65	24	17	44	47
2.	WTP in Rs.'000	15	95	20	4	10	48	638	82	21	35	328	24	5	50
3.	Expected Rate of Interest (%)	19	16	18	16	14	17	19	18	17	16	17	17	16	16

Source : ORG Survey ,1995.

5.7 New methods of infrastructure management

a) Households

On the suggestion of changes/ measures to be introduced for infrastructure development, most popular opinion in most of the cities is that a 10% subsidy be given to the regular payers of water supply/ sewerage charges. The next most preferred option is that property tax should be paid only if water supply/ sewerage house connections are available. Some other suggestions put forward are that the major repairs or services made in one's locality should be shared by all. Or, the Charges should be based on the location of the house in the city.

b)   Industries

In response to the question on the Industries, Willing to Join BOT/ BOO/ Scheme, the industries expressed unanimity. Very few of them wish to invest in such schemes with the highest percentage (44%) being in Bhubaneswar and Lucknow which is absurd. In this Case the money that they are ready to invest is not more than Rs.25,000 as shown below.

Industries Willing to Join BOO/ BOT/ Schemes

Description	Vizag	Solapur	Bhubaneswar	Lucknow
% Willing to join	10	16.5	44	43.5
WTP (Avg.)Rs.	11,000	2,500	14,900	25,800

Source : ORG Survey, 1995.

CHAPTER - VI

DETERMINANTS OF WILLINGNESS - TO - PAY

CHAPTER VI

DETERMINANTS OF WILLINGNESS TO PAY (WTP)

6.1 Introduction

In the context of the need for improvement in the WS/SW services, the WTP analysis turns out to be a powerful tool to investigate into its financial viability. It may be recapitulated that in chapter IV, a detailed analysis on the consumers' WTP under different alternatives (Improvements in the present as well as future level of services) have been considered. However, this relates to one point of time. In the present analysis, it is therefore attempted to develop a methodology to estimate the WTP and provide a tool to assess the implications of various pricing alternatives. This- exercise is felt to be all the more essential to understand the implications of different investment strategies pricing and efficiency, financial self sufficiency, affordability and equity. This type of approach is adopted for and useful in perspective planning and also designed to help in the appraisal mechanism. In this connection, the present chapter deals exclusively on the quantitative estimations of the results for the determination of WTP related to the WS and SW services; however, more emphasis is laid on the former as that service is relatively better spread than the latter. The whole exercise is expected to pave the way for the development of a Simulation Model.

6.2 The Data

The sources of data are both secondary and primary. The primary data is generated through structured questionaires/ check lists from the user based field surveys. Besides, information generated through discussions has also been used. One common element that has been kept in view in this process is that the consumers are mostly using either one or more sources as the case may be. For instance, while in the case of Bhubaneswar the consumers use mostly the house connection, in the case of Visakhapatnam or Surat, dependence is observed on both standposts as well as house connections. In this regard, the following aspects have been considered :

(i)   standposts

(ii)   higher water charges for house connections

(iii)   improvement to the system

(iv)   new connections

So as to fit into the overall framework of the model, an attempt is made to select relevant explanatory variables. Table 6.1.shows the explanatory variables used.

Table 6.1 : Selected Parameters

(AVERAGES)

CITY	SURAT	RAIPUR	SOLAPUR	VIZAG	BHUBAN ESHWAR	DELHI	MADRAS	LUCKNOW
HH_INCM	5194.65	3594.31	2854.76	3475.79	5086.04	6049.18	3756.45	5677.99
T_HOUSE	3.79	3.15	4.18	3.21	6.09	3.90	3.56	3.65
O_HOUSE	1.79	1.87	1.88	1.84	2.00	1.83	1.73	1.88
SUMM_USE	39.28	30.95	22.85	20.73	30.95	21.16	15.80	25.49
P_TAX	457.80	518.00	907.80	807.00	180.80	1433.00	1016.00	00.00
MAINT	107.40	122.80	284.60	84.05	64.92	58.07	89.72	62.03
ELEC	233.00	134.00	131.40	112.80	180.40	201.40	183.00	209.40
SATI	1.43	1.70	1.47	1.15	1.31	1.54	1.36	1.77
NMUN_CAP	2254.82	5004.70	2046.15	3017.45	3172.93	3376.65	3305.00	2780.27
NMUN_MM	1.83	42.52	69.40	36.23	44.55	44.11	72.21	65.63

HH_INCM = House hold income (Rs)   P_TAX = Property tax (Rs)
T_HOUSE = Type of house   ELEC = Electricity bill (Rs)
O_HOUSE = Ownership   MAINT = Non-municipal maintenance (water)
SUMM_USE = Summer use(water)   SATI = Satisfaction with municipal Supply
NMUN_CAP = Non-municipal capital(sani)   NMUN_MM = Non-municipal monthly exp.(sani)

For the purpose of Multivariate analysis, an attempt is made to normalize the figures. For instance,

-        household income in Rs. '000,

-        property tax in Rs. '000 ,

-        electricity bill in Rs. '00 ,

-        consumption of water in 10 litres.

6.3   Methodology and Approach

There are different methods used in the analysis. They are :

(a) Direct Valuation Method

(b) Contingent Valuation Method (CVM)

In this chapter item (b) has been chosen in view of two reasons ; (i) its un biased nature and (ii) its relevance in formulating pricing policy, in the long run. This method has been used to value public goods like water supply, sewerage system, roads and environmental amenities. Its use in case of water supply and sanitation is relatively of recent origin. Though the explanatory power of models based on CVM is relatively small, it is the best tool available to assess the behavior of the consumer to the improved service levels. The feasibility of the service level is, clearly a function of connections and at the same time the number of connections is a function of level of service. Thus the relationship between service level and the number of connections are interdependent. The essence of CVM is specification of hypothetical market for the commodity which is presently a subsidised one. The CVM method gives a picture of consumer behavior and responses to the improved level of services. In this connection, the CVM deals with the following:

(i)   users' affordability in terms of WTP

(ii)   the relationship between the consumer behavior and pricing.

6.3.1   Estimation Technique Used

Generally, the estimation techniques used in the CVM are :

(i)   Ordinary Least Square (OLS)

(ii)   Probit Analysis.

In the present context, The former method is used for estimating the WTP, while the latter is used in the next chapter to study the sensitivity of the pricing.

The sample households are divided into the following groups :

a)   with house connection

       (i) WTP higher for existing connection

       (ii) WTP more for improved connection

b)   Without house connection

       (i) using standposts

       (ii) opting for new connections

For meaningful analysis, these four subgroups have to be mutually exclusive. This condition reduces the number of observations for the analysis by CVM due to:

(i)   no response from the consumer

(ii)   elimination due to separation into disjoint groups.

The respondent size in various cities is depicted graphically in figures 6.1 and 6.2.

At the outset the consumer is neither sure of the improvements in the municipal service nor of how much to bid, and this introduces uncertainty. However, the consumer tries to minimize uncertainty by
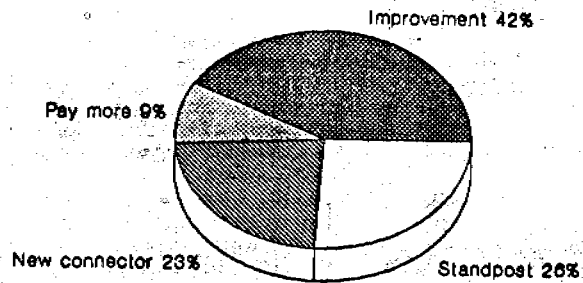
Fig. 6.1 : RESPONDENTS SIZE

City - Surat

Improvement 39%
Pay more 18%
Standpost 15%
New connector 28%

City - Delhi

Improvement 78%
Standpost 9%
New connector 6%
Pay more 7%

City - Solapur

Improvement 42%
Pay more 9%
New connector 23%
Standpost 26%

City - Bhubaneswar
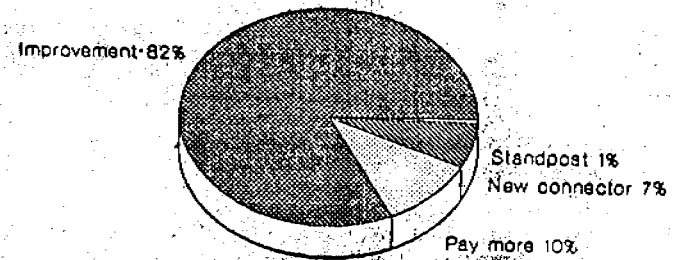

Improvement 82%
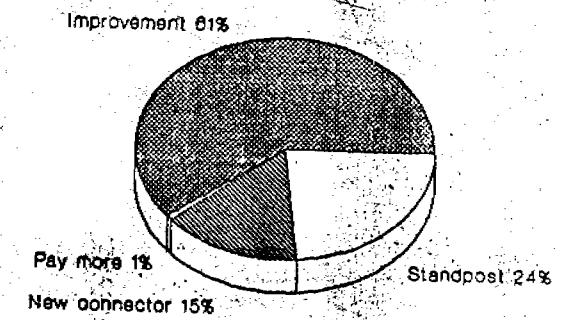Standpost 1%
New connector 7%
Pay more 10%
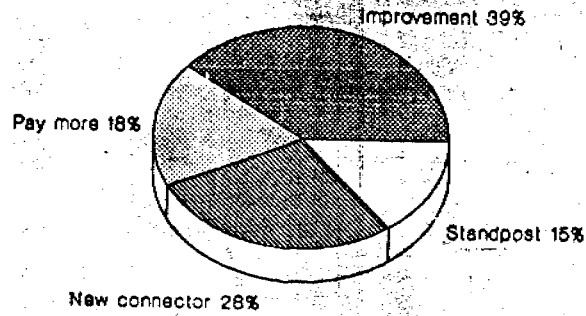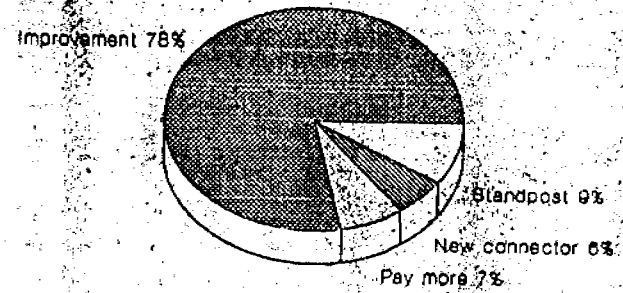
Fig. 6.2 : RESPONDENTS SIZE

City - Raipur

Pay more 26%
Improvement 25%
New connector 13%
Standpost 36%

City - Visakhapatnam

Improvement 42%
Pay more 19%
New connector 15%
Standpost 24%

City - Madras

Improvement 43%
Pay more 14%
New connector 13%
Standpost 31%

City - Lucknow

Improvement 61%
Pay more 1%
New connector 15%
Standpost 24%
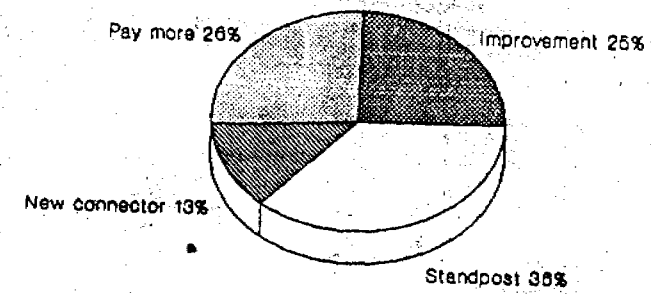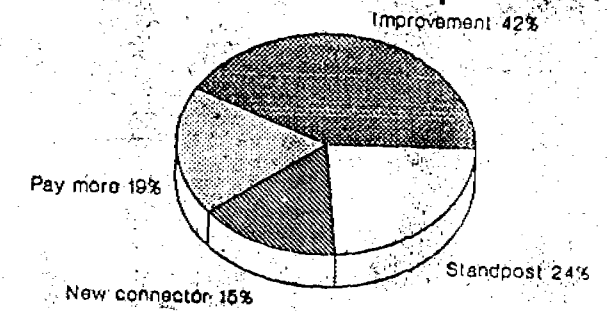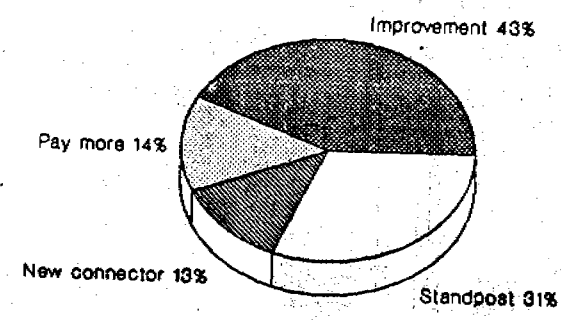
using multiple choice. For example, the respondents have revealed their preferences for stand post and also house connection.

6.4   **Circumstances Leading to Investment in Private Services**

The main consideration determining the private investment is poor level of service. In view of this, the consumers have gone in for private investment which involves investments in Tubewell, OHT, Sump, etc. However, the private investment could be reversed in favour of the pubic service if the public service level improves. To this extent, the consumer would be able to experience a saving in his expenses which otherwise he might have to incur in the maintenance of the private facilities created as shown in Table 6.2.

Table 6.2 : Capital Investment on Private Sources by the Households -1994

Sr. No.	City	Water Supply			Sewerage		
		Estimate (Rs)	Growth (%)p.a.	R^2	Estimate (Rs)	Growth (%)p.a.	R^2
1	Delhi	6500	2.8	0.62	5100	2.6	0.34
2	Madras	10900	2.1	0.46	3900	1.1	0.26
3	Lucknow	16000	3.21	0.37	4800	2.8	0.39
4	Surat	9050	2.2	0.53	3500	2.3	0.08
5	Vizag	13000	4.8	0.59	4600	3.0	0.58
6	Solapur	12600	3.4	0.82	2000	0.2	0.01
7	Raipur	16000	4.4	0.64	7600	5.8	0.51
8	Bhubneshwar	9700	3.2	0.46	4500	2.75	0.51

Source : ORG Survey, 1995.

From the above table the following facts emerge :

- Investment is higher in WS than SW.

- High investment levels are prevalent in Raipur and Lucknow for both WS and SW.

- High costs of WS are observed in Solapur, Raipur and Vizag.

- Lowest costs are observed in Delhi WS.

- Surat and Solapur recorded very low investments in SW.

Though the survey carried out is cross-sectional, the Capital investments by the hhs in non-municipal sources relates to different years. The investment amounts vary mainly with respect to time(years) and other technical parameters like type, size, capacity and quality of construction ,etc. The cost escalation factor has been obtained by studying the time_series of past investments. The variation within a year has been taken as disturbance in the time series. Now a straight line to this time_series has been tied to fit in. The slope of the line fitted gives the cost escalation factor. The steps involved in this analysis are as follows.

1) obtain average of investment within a given year and thus obtain time series,

2) fit a straight line to the time-series data,

3) through linear regression obtain an estimate of the investment required and the cost escalation factor,

4) project each of the past·investment figures using a simple interest formula to get present value of past investments,

5) use these projected figures in the regression for WTP analysis.

6.5 Water Supply Sector

The Linear model has been proposed for all cities, except Madras. In the case of Madras, the linear model could not be validated due to heterogeneous responses with respect to WTP. Hence a multiplicative model (Double-Log) is tried out. This model is found to give fairly good results. The estimates for the determinants of WTP are discussed below by each category. The results of multivariate analysis are presented in Annexures 6.1 to 6.6.

6.5.1 Pay more for the existing service :

The WTP average figures in this category are illustrated in figure 6.3. The WTP depicted is in addition to the existing charges. As we have separated this category from (fig) the bids of improvement, these are the bids for the existing level of services. From the figure it is clear that the consumers of Solapur have higher WTP with Rs.67.63 compared to any other city. This is followed by Delhi with Rs.52.97.

The regression results under this category are presented in Annexure 6.1. It contains the values (coefficients under OLS) of the determinants for all the cities. The best results are obtained for Bhubaneshwar with r^2 =0.65 followed by 0.45 in Vizag. Clearly, the size of connection emerges as an important variable. Nevertheless, household income is definitely a highly contributing variable. In Surat it increases the WTP by 2.84 times while in Bhubaneswar it reduces the WTP by 2.16 times. The Surat income coefficient is significant at
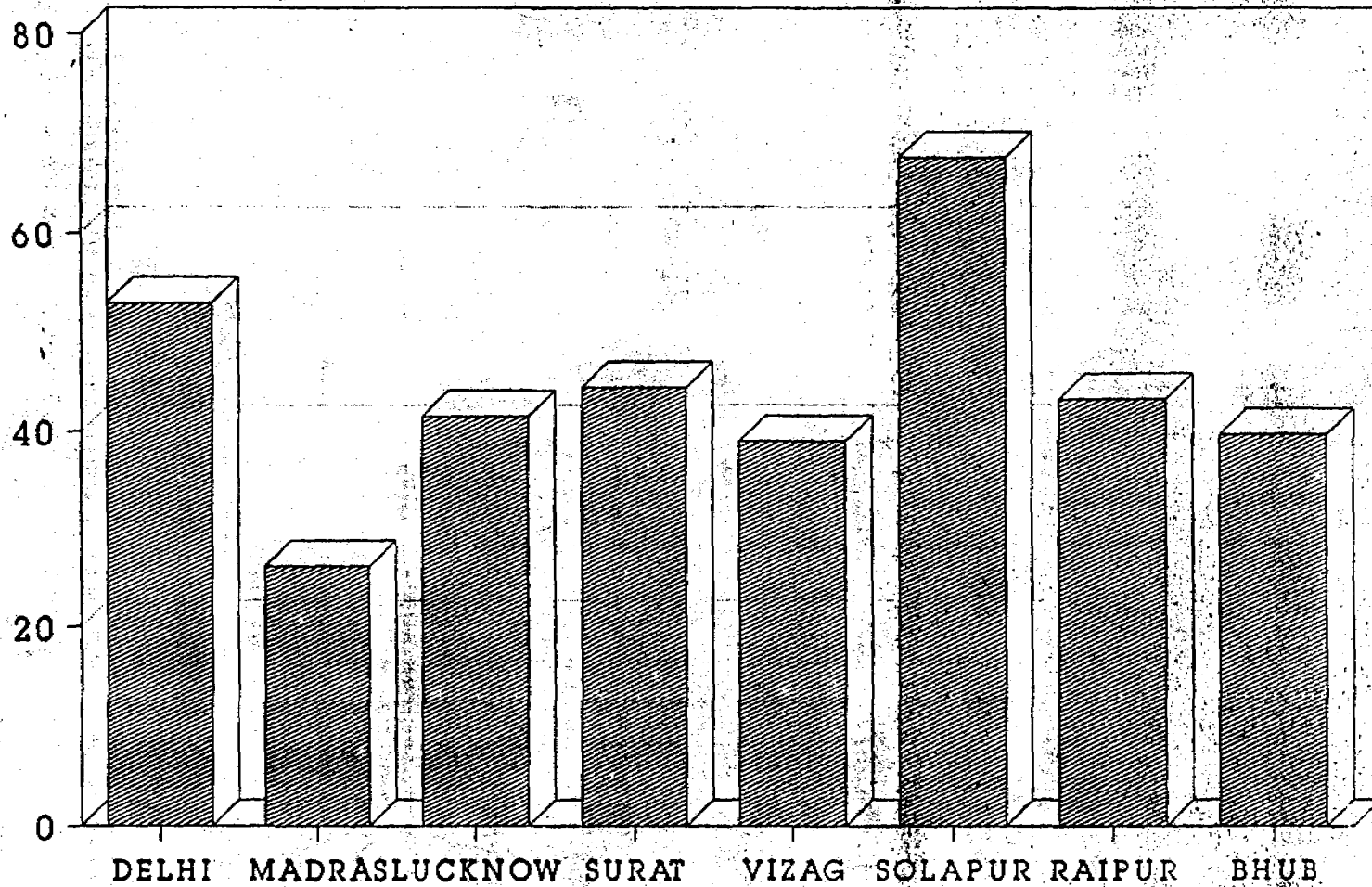
PAYING MORE FOR PRESENT SERVICE

Unit : Rs.

Figure 6.3

99% level. Contribution of income is least in Raipur with a value of 0.09. The private source maintenance contributes highly in Bhubaneswar with 5.47 followed by Vizag with 3.18. The Vizag maintenance coefficient is significant at 95 % ;level.

6.5.2   Improvement of WS services :

(a) Capital charges : The figure 6.4 shows the average WTP for capital charges under improvement. All the bids are in three digit except in Solapur and Lucknow which show unusually high value of Rs.1895/- and Rs.1711/-. The lowest is in Bhubaneswar with Rs.590/-. It may be remarked that normally the demand for improvement is lower than that for New-connection. In Lucknow and Solapur this gets reversed. The higher demand bid in Solapur appears to be due to the ongoing project of Yashwant Sagar Water Supply Scheme. The high figure in Lucknow is a result of small biased sample.

The regression results are presented in Annexure 6.2. It contains the OLS estimates of explanatory variables for all the cities. A look at r^2 values reveals that comparatively good results are obtained for Solapur followed by Surat. Household income is significant in all cities except Raipur, Bhubaneswar at 95% probability. In Lucknow most of the explanatory variables are statistically significant. Though size of connection has high coefficient, it is the household income that is highly contributing. This variable is positive whenever it is significantly supporting the logic that higher income groups have higher WTP

compared to the lower income ones. Another important determinant that may be noticed is the cost of maintenance of private source. This is a positive coefficient meaning higher the maintenance costs higher the WTP. Again it is the highest in Solapur and also significant at 99% probability.

(b) **Monthly charges** : The figure 6.5 shows the average figures under this category. The households in Lucknow report highest with Rs.37.84 for maintenance followed by Bhubaneswar Rs.35.90. The lowest is in Raipur with Rs. 17.45. It may be observed that compared to new connection monthly charges these are lower reflecting the dissatisfaction. Consumers reported a clear preference in favour of higher monthly charge to an exorbitant one time charge.

The results of OLS are presented in Annexure 6.3. Relatively good results are obtained in Solapur where r^2 = 0.31 followed by Lucknow with r^2 = 0.25. The household income contributes highly in Solapur and Madras with Rs.3.11 and 1.13 respectively. This coefficient is significant in all cities except Vizag. Electricity with 4.9 and maintenance of private source with 4.77 are contributing factors in Bhubaneswar. Both are statistically significant at 95% level. Satisfaction at 9.82 and Source 7.68 are the other two significant coefficients at same level. Source coefficient is positive meaning the users of multiple sources pay more compared to users with only house connection.

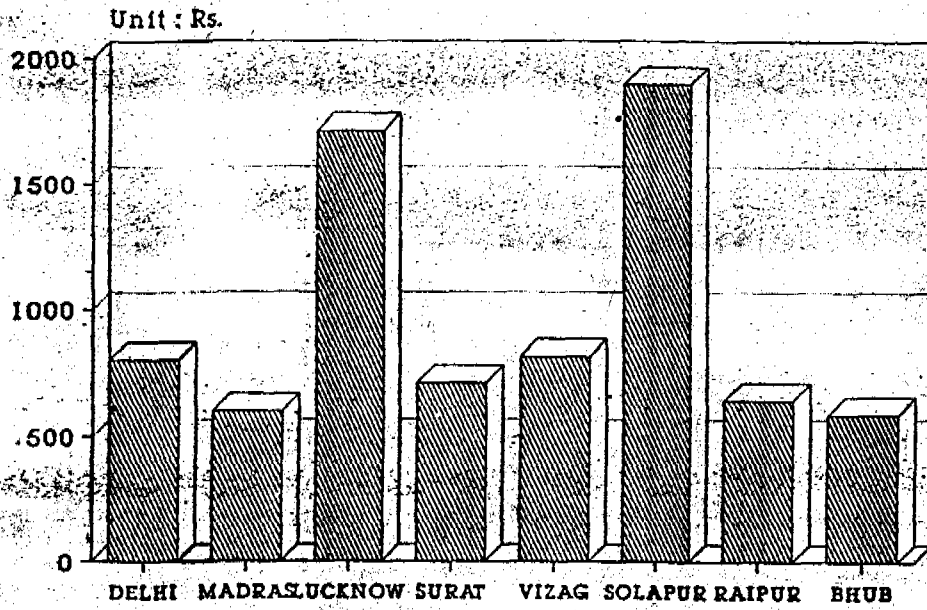# ONE-TIME CHARGES FOR IMPROVEMENT OF EXISTING CONNECTIONS

Figure 6.4

IMPROVEMENT OF EXISTING SUPPLY MONTHLY CHARGES
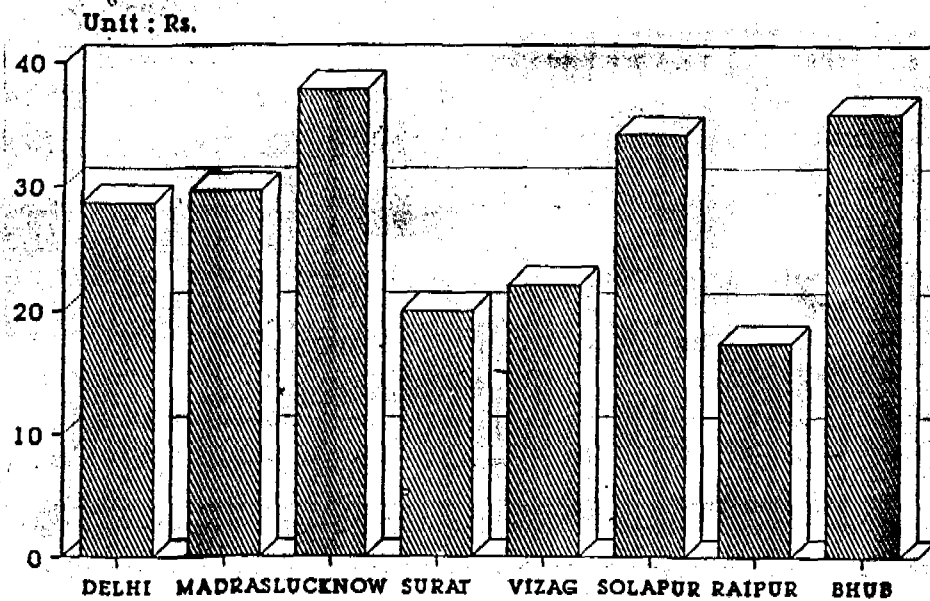

Figure 6.5

6.5.3 New connections

(a) Capital charges : The average payment which varies around Rs. 1000 by the households is depicted in figure 6.6. The figures are consistently higher than the corresponding figures of improvement. The highest Rs. 1545/- is in Bhubaneswar and lowest Rs. 950/- in Delhi. The regression results provide an explanation to the lower payment in Delhi. The regression results are presented in Annexure 6.4. While Bhubaneswar with $r^2 = 0.64$ and Surat with $r^2 = 0.59$ give excellent fit, the poor one is Madras with 0.19. Household income has high coefficient in Solapur with 195.23 and Lucknow with 172.9 which are both significant at 95% level. In Bhubaneswar it has high value but on negative side taking -165.43. Very high negative estimates for the connection size in Raipur with -1994 and Delhi with -1274.8 may be noticed and at the same time equally high but positive in magnitude is in Vizag with 1452.3. In Delhi both type of house and satisfaction are negative. It means that people living in bungalows and flats are not ready to pay higher amount. This is further aggravated by not satisfied bidding low. We may note that Delhi has high average property tax at Rs.1400/-. The coefficient of satisfaction is negative in Delhi -141.4 and Solapur -428.4. It means that consumer satisfaction plays positive role in increasing WTP.

(b) Monthly charges : The average figures for the WTP are depicted in Fig 6.7. They vary about Rs.25/- which is the figure for Vizag. The high WTP Rs.36/- occurs in Bhubaneswar and low WTP of Rs.17/-

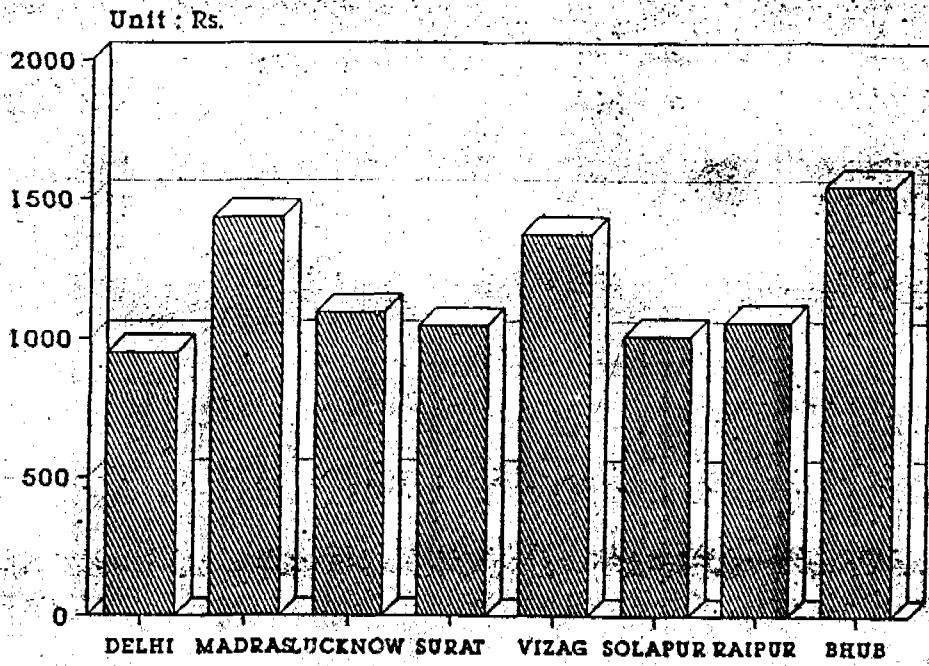# NEW CONNECTIONS - ONE TIME CHARGES
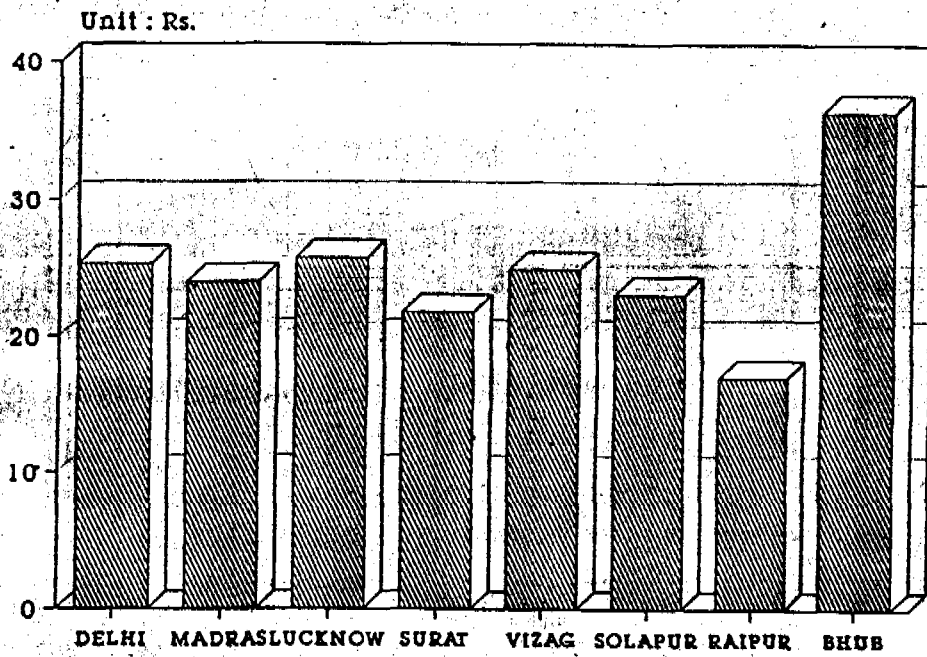

Figure 6.6

NEW CONNECTIONS - MONTHLY CHARGES

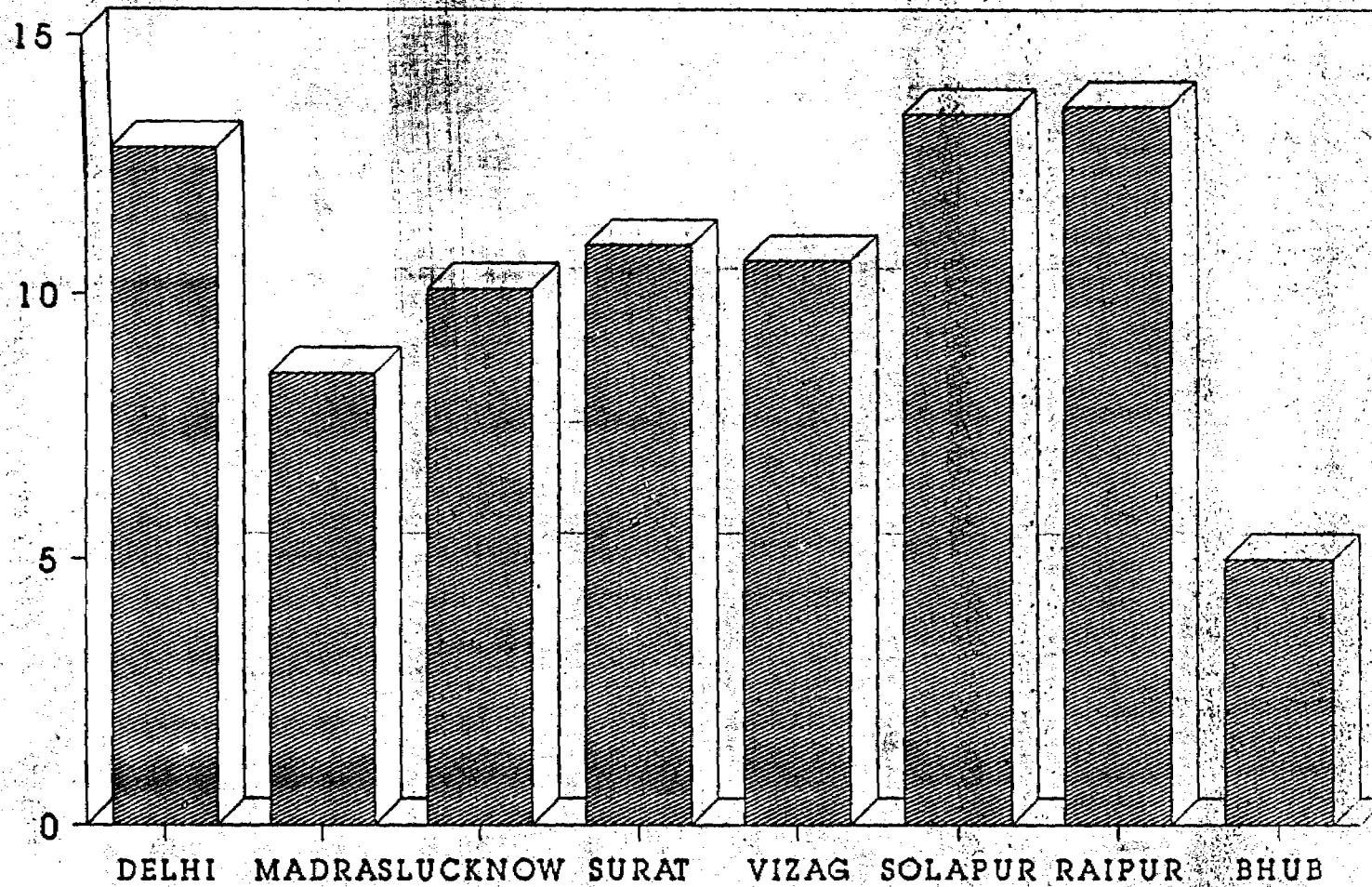Figure 6.7

MONTHLY CHARGES FOR A STAND POST

Unit : Rs.

Figure 6.8

6.6.1   Improvement of Existing Services :

a)   Capital charges : The average WTP under this category is depicted in figure 6.9. The WTP for SW service is lower compared to the WS. In the case of SW, the highest WTP is Rs.730/- for Solapur followed by Rs.678 in Lucknow and the lowest is in Madras Rs.304/-.

The determinants of WTP are presented in Annexure 6.7. Best results are obtained for Surat, Vizag and Solapur. Ownership of the house is certainly an important factor with positive estimate. It means that tenants are more prepared to pay than the houseowners. For Vizag, ownership coefficient is 1139.39 and is the highest contributing factor. Another important factor responsible for WTP is the capital charge. It is significant at 95% level in Surat, Solapur and Bhubaneswar. In Delhi, the estimate of non-municipal expenditure is significant at 99% probability and also the highest contributor with a coefficient value at 188.74. It explains the bigger part of the WTP. Household income is significant at 95% level in Surat, Vizag and Lucknow.

b)   Monthly charges : The figure 6.10 illustrates graphically the average WTP under this category. The highest is in Solapur with Rs.31/- followed by Rs.27/- in Bhubaneswar. The lowest Rs.12/- is in Vizag. The high WTP in Solapur can be attributed

ONE-TIME CHARGES FOR IMPROVEMENT OF EXISTING CONNECTIONS - SEWERAGE

Unit : Rs.
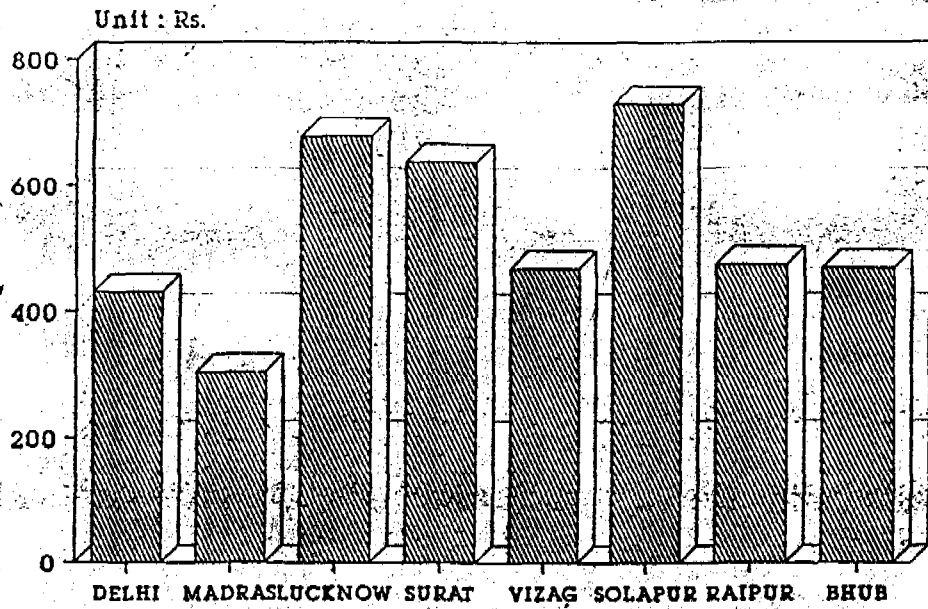
Figure 6.9

IMPROVEMENT OF EXISTING SUPPLY MONTHLY CHARGES - SEWERAGE

Unit : Rs.
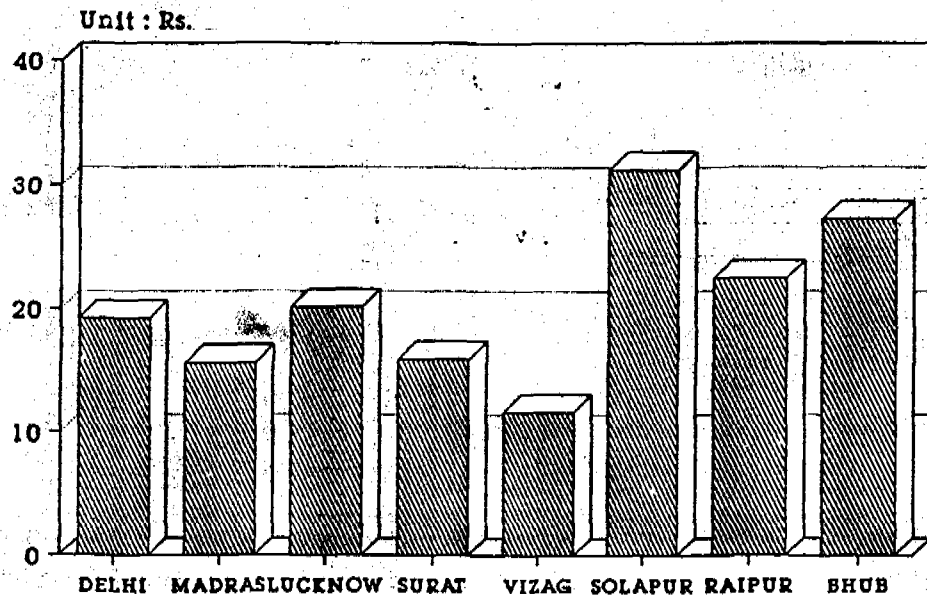
Figure 6.10

to higher incomes as revealed through regression coefficients.

The results of regression are presented in Annexure 6.8. All cities have reasonably good r^2 values except Madras in view of its scarce water supply situation. The household income has positive sign whenever significant. It shows that as income level increases, the WTP increases. In Bhubaneswar, the cofficient is 13.75 significant at 90% level for the property tax. In the case of Delhi, it is 1.9 coefficient for the same tax. In Lucknow all explanatory variables are significant. The higher coefficient happens to be ownership of house with 2.73. Hence tenant status contributes in a big way. In other cities like Surat, Vizag and Madras also, the tenants willingness to pay is higher compared to the owners'.

6.6.2   **New Connections:**

a)   **Capital charges** : The average WTP in this category are shown graphically in Figure 6.11. The tallest bar is in Vizag with Rs.1129/- and smallest bar in Bhubaneswar with Rs.846/-. The figure also shows very less variation from city to city. The WTP for SW is very low compared to water supply. The results of multivariate analysis are presented in Annexure 6.9. Which indicate that Lucknow, Surat and Madras have better results. But inspite of poor fit, the coefficients of individual explanatory variables turn out to be significant. For example, in the case of Delhi although the $r^2 = 0.07$, the non-municipal investments of

the owners are significant at 99% level. In general, two variables become significant- Property tax and Ownership of house. In this connection, both the variables have significant effect and their joint effect determines the major chunk of WTP.

b) **Monthly charges :** The Figure 6.12 depicts the average WTP. The highest WTP is observed in Bhubaneswar with Rs.41/- and lowest in Surat with Rs. 13.97. Thus the variation among the cities is considerable. The results of regression are shown in Annexure 6.10. A look at r^2 value shows all results are statistically not very significant. High constant shows bulk of WTP is independent of explanatory variables. In Delhi and Raipur Property tax coefficient is significant at 90 pecent.

NEW CONNECTIONS - ONE TIME CHARGES
SEWERAGE

Unit : Rs. (Thousands)
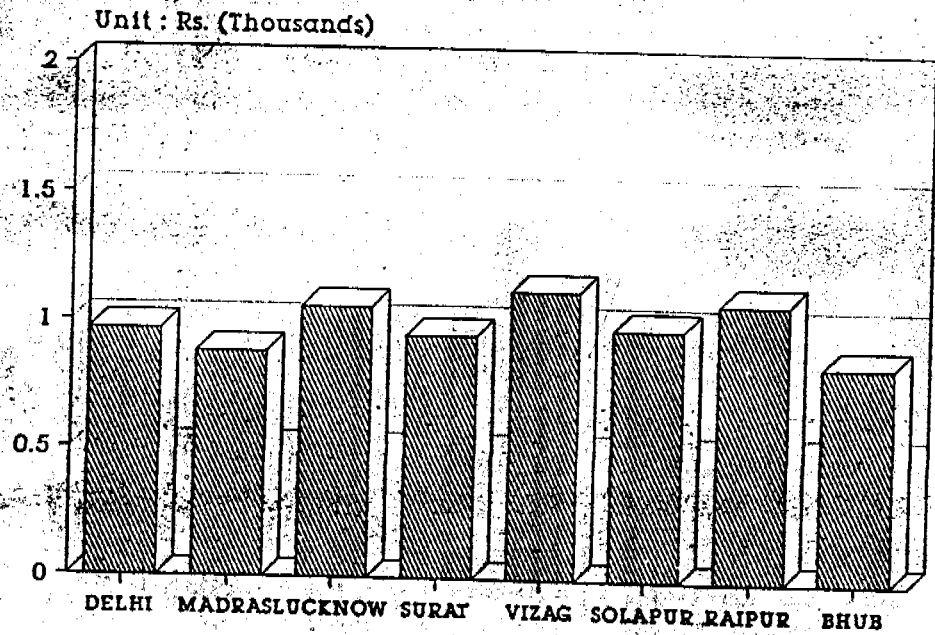
Figure 6.11

NEW CONNECTIONS - MONTHLY CHARGES
SEWERAGE

Unit : Rs.
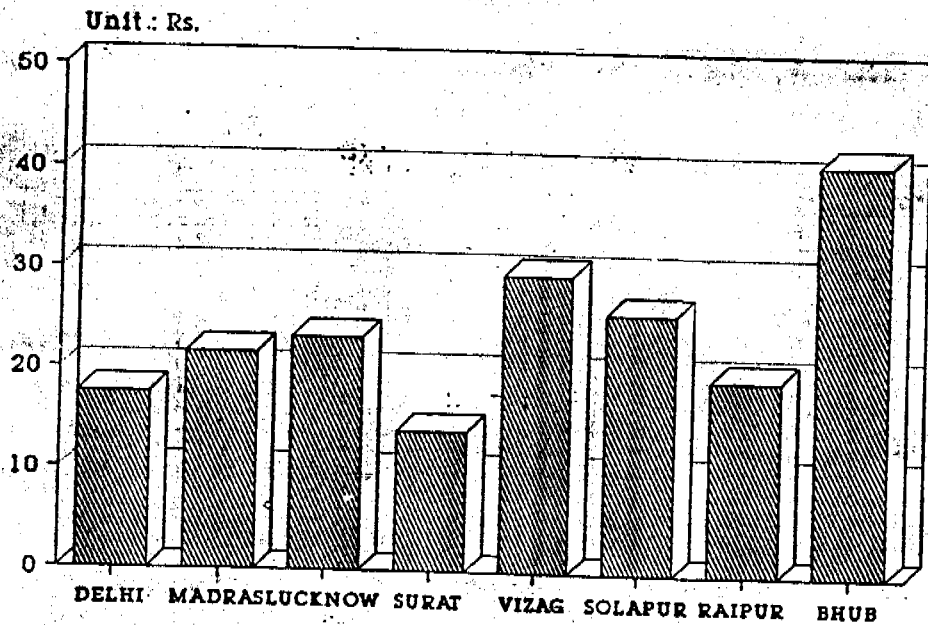
Figure 6.12

Water Supply Sector.

Annexure 6.1 : Pay more Category : Existing service

Method = OLS

WTP	Surat	Solapur	Raipur	Vizag	Bhuba-neshwar	Delhi
Size	11.99	-11.13	-28.00	-15.61	-	-1.37
O.House	.64	13.24	-8.80	-8.77	-	5.00
EDU-M	-.556	-4.89	2.19	2.93**	2.84	4.02
Maintenance	1.04	.28	-.646	3.18**	5.47	.63
SUMM-USE	-1.63	-1.22	.77	4.88	-3.72	-.780
T-House	.43	1.39	1.73	-1.50	.72	-2.43
Satisfaction	-.420	2.59	-9.02	5.48	20.06	-2.82
Electricity	-1.02	.72	3.24	1.40	-6.16	1.88
HH Income	2.84***	1.34	.10	1.18	-2.16	.38
Source	.97	1.13	.09	.18	17.90	.61
Constant	28.11*	34.75	60.78*	27.27	-62.8	25.68
R² Value	.32	.38	.12	.45	.65	.13
No. of observation	63	24	58	45	17	60

Level of Significance : at 99% probability ***
at 95% probability **
at 90% probability *

Water Supply Sector

Annexure 6.2 : Improvement Category : WTP Capital Charges

Method = OLS

WTP	Surat	Solapur	Raipur	Vizag	Bhuba-neshwar	Delhi	Madras	Lucknow
Size	-197.59	1244.76	-196.05	-122.00	429.89	-108.24***	.20	234.61
O.House	-9.19	822.25	-164.00	-226.40	-	26.73	-.159	26.10
EDU-M	16.21	110.87	-3.120	26.50	-10.83	13.03	.11	54.03*
Maintenance	29.76***	74.84**	2.83	.13	44.44**	4.61	-.037	37.27***
SUMM-USE	10.71	-267.21	7.95	47.47	-.72	61.144***	.01	74.53**
T-House	23.30	54.51	31.45	5.45	21.98	7.88	.02	117.62***
Satisfaction	-32.22	44.58	60.16	20.90	83.53	65.65	-.137	364.72***
Electricity	1.49	119.57**	5.70	-20.36	-7.529	105.95***	-.015	33.24
HH Income	34.22	167.00	-1.38	38.73**	-9.251	31.62***	.08	49.16***
Source	7.39	-6.92	32.01***	34.16**	71.65	-19.62*	-.041	-27.03
Constant	423.14*	-1303.59	611.92	704.54	-55.21	131.42	6.110**	-614.04*
R² Value	.30	.04	.15	.14	.08	.27	.13	.42
No. of observations	135	108	56	99	133	623	99	389

Level of Significance : at 99% probability ***
at 95% probability **
at 90% probability *

Water Supply Sector

Annexure 6.3 : Improvement Category : WTP Monthly Charges

Method = OLS

WTP	Surat	Solapur	Raipur	Vizag	Bhuba-neshwar	Delhi	Madras	Lucknow
Size	.63	20.24	4.93	-5.604	68.00**	-2.897***	.25	2.89
O.House	.92	2.89	-5.99	1.54	-	-1.02	-.589**	2.02
EDU-M	.33	.72	.40	-.339	.37	.35	.397**	.08
Maintenance	-.11	.18	.023	-.117	4.773**	.233*	.08	.26
SUMM-USE	.512	-2.82	1.96**	1.66	.5167	.760	.028	-1.212*
T-House	.50	.83	-.094	.18	1.19	1.123**	-.081	2.64**
Satisfaction	.12	-.180	2.18	-1.36	9.892**	2.503*	-.259	7.159***
Electricity	.08	-.459	.59	-1.09	2.65	4.648**	-.794	1.75**
HH Income	.554***	3.11***	-.982*	.18	.4711**	.481***	.03	.612***
Source	.14	-.321	-.125	-.036	7.686**	-.340	-.065	-.106
Constant	8.55*	9.58	17.51	21.73	-62.318**	11.50**	2.78	-.086
R² Value	.20	.31	.17	.03	.24	.18	.19	.25
No. of observation	130	99	55	99	133	676	99	389

Level of Significance : at 99% probability ***
                        at 95% probability **
                        at 90% probability *

Water Supply Sector

Annexure 6.4 : New Connections Category : WTP Capital Charges

Method = OLS

WTP	Surat	Solapur	Raipur	Vizag	Bhuba-neshwar	Delhi	Madras	Lucknow
Size	-392.97	-565.07	-1944.13*	1452.31	-	-1274.82	-.63	381.13
O.House	170.08	239.76	425.91	601.11	-587.31	654.45	-	270.00
EDU-M	12.14	-11.07	-82.82	30.46	892.56	29.87	.15	19.15
Maintenance	130.88**	-28.52	-35.08	75.19	284.65	-5.00	.33	-9.32
SUMM-USE	9.84	-102.99	-93.83	-147.22	-1295.09	272.03**	-.151	166.35**
T-House	24.64	-26.03	40.50	30.63	-278.93	-20.86	.03	10.55
Satisfaction	373.62	-428.42*	128.01	151.92	-	-141.43	-168	170.97
Electricity	-39.65	55.47	-119.05	-139.35	-530.27	361.10	-.495	31.66
HH Income	96.27***	195.23**	62.54	26.74	-165.43	99.40**	.06	172.90
Source	-.249	-4.412	-30.01	33.38	242.24	17.32	.03	17.00
Constant	-602.90	1402.89	1235.44	-547.09	-138.65	-1329.06	5,91	-1083.23
R^2 Value	.59	.20	.36	33	.64	.39	.19	.41
No. of observations	97	69	29	35	11	48	34	96

Level of Significance : at 99% probability ***
at 95% probability **
at 90% probability *

Water Supply Sector

Annexure 6.5 : New Connection Category : WTP Monthly Charges

Method = OLS

WTP	Surat	Solapur	Raipur	Vizag	Bhuba-neshwar	Delhi	Madras	Lucknow
Size	-11.01	5.97	22.13**	16.20	-	38.52	.70	9.92
O.House	-.048	4.84	2.12	4.73	-8.45	-3.98	-	4.65
EDU-M	-.334	.06	-.902	.72	12.06	4.08	-.205	-.357
Maintenance	-.368	-.304	.26	.08	-9.67	-.097	.09	.11
SUMM-USE	.69	.14	.97	-2.59	19.95	-3.09	-.054	.23
T-House	-.746	.50	.99	1.59	8.03	1.40	.09	1.04
Satisfaction	3.66	-2.18	9.00	-.026	-	6.47	.50	7.33
Electricity	.01	-1.62	-1.45	-.258	2.69	1.95	-.051	-.718
HH Income	1.04**	2.09**	-.928	.12	-2.95	-.069	.02	1.70
Source	-0144	-.187	.30	.08	-6.365	.87	-.0017	.64
Constant	13.50	15.24	-7.780	8.36	-2.822	-10.21	2.556***	-13.78
R^2 Value	.34	.23	.41	.25	.84	.16	.25	.08
No. of observations	97	60	29	36	11	49	34	96

Level of Significance : at 99% probability ***
at 95% probability **
at 90% probability *

Water Supply Sector

Annexure 6.6 : Stand Post Category : WTP Monthly

Method = OLS

WTP	Surat	Solapur	Raipur	Vizag	Bhuba-neshwar	Delhi	Lucknow
Size	-3.05	8.15	7.414**	-6.34	-	-2.39	-2.87
O.House	4.80**	.76	2.50	-1.65	-	.62	-.846
EDU-M	.05	.20	.13	.04	-	-.48	.06
Maintenance	-.263	-.727***	-.172	-4.07	-	.15	-0.19
SUMM-USE	-.703	-.679	-.660	1.20	-	-1.03	-1.22
T-House	.99	.17	-.231	.853*	-	.72	.30
Satisfaction	-.942	-1.32	.27	5.11**	-	-2.81	1.54
Electricity	.39	.33	.14	-1.41	-	.37	1.08
HH Income	.35	1.95**	2.44***	1.74*	-	.68	.22
Source	-.052	-3.67***	.634**	.634*	-	.24	.09
Constant	1.35	78.84***	-9.113	9.48	-	9.48	7.07
R² Value	.51	.25	.30	.41	-	.20	.09
No. of observations	51	67	79	56	-	76	150

Level of Significance : at 99% probability ***
at 95% probability **
at 90% probability *

Sewerage Sector

Annexure 6.7 : Improvement Capital Charges

Mehtod = OLS

	Surat	Vizag	Solapur	Bhuba-neshwar	Delhi	Madras	Lucknow
Non-municipal capital exp.	129.43	11.43	-	-103.78	188.41***	-16.74	77.28***
Household income	31.24***	100.03	-3.16	1.37	13.51	9.58	35.56
Ownership of house	112.26	1139.39	293.60	-	117.81	17.41	35.61
Type of house	-12.29	-37.22	39.48	-9.69	3.29	-.637	16.84
Education	1.99	25.14	-29.96	8.08	3.97	23.49	79.06***
Property tax	276.59***	130.38	273.42***	256.00**	18.08	-36.21	-
Constant	159.45	-2422.38	-107.04	439.31	6.95	150.84	-165.77
r^2	0.59	0.44	0.32	0.05	0.16	.02	.14
Observations	224	22	49	118	203	145	379

Level of significance :
at 99% probability ***
at 95% probability **
at 90% probability *

Sewerage Sector

Annexure 6.8 : Sewerage Improvement Monthly Charges

Method = OLS

	Surat	Vizag	Solapur	Bhuba-neshwar	Delhi	Madras	Lucknow
Non-municipal capital exp.	.78	-.0247	-	-.3115	.1365*	.0538	.0529***
Household income	.3222***	-.3845	1.91*	-2318	.7154***	.0457	.3704**
Ownership of house	2.25	10.18	-8.72	-	.0757	-2.36	2.73*
Type of house	.1115	.5557	1.18	1.57	1.23	.5745**	.52**
Education	.5447	.4111	2.05	-1.42	1.11	.9248	1.24
Property tax	.4075	4.44	-.7158	13.75	1.90***	-.2357	-
Constant	6.76	-15.88	22.65	24.16**	-.6358	12.07***	2.80
r²	0.13	.198	0.186	0.08	0.15	0.07	0.13
Observations	210	24	49	118	240	155	379

Level of significance :
at 99% probability   ***
at 95% probability   **
at 90% probability   *

Sewerage Sector

Annexure 6.9 : Sewerage New Connections Capital Charges

Method = OLS

	Surat	Vizag	Solapur	Raipur	Bhuba-neshwar	Delhi	Madras	Lucknow
Non-municipal capital exp.	-.7661	9.17	33.36	-19.50	50.07	53.89***	-51.59***	21.60
Household Income	49.65***	47.10	37.92	34.87	-2.95	27.71*	13.47	56.90***
Ownership of house	118.04	259.03	-116.68	-70.93	.	383.68***	-177.46**	-60.19
Type of house	44.87	19.80	-5.22	.1611	11.16	-29.42	-4.19	105.31***
Education	33.32	46.32	21.75	60.96*	46.10	-3.45	-58.08**	-.1497
Property tax	194.37	349.92**	102.38	-256.09	-783.80	7.83	383.79***	.
Constant	148.58	-187.88	1001.59***	882.09**	530.41*	1626.63***	1262.43***	457.64*
r²	0.41	0.17	0.05	0.07	0.13	0.07	0.24	0.40
Observations	112	109	106	108	39	330	209	206

Level of significance :

at 99% probability   ***
at 95% probability   **
at 90% probability   *

Sewerage Sector

Annexure 6.10 : New Connections Monthly Charges

Method = OLS

	Surat	Vizag	Solapur	Raipur	Bhuba-neshwar	Delhi	Madras	Lucknow
Non-municipal capital exp	2.30	.0036	.0776	.0824	-.0656	.0493**	.1695	.0016
Household Income	.3416	1.34	3.26**	1.08	-.8992	.2138	1.88	.1350
Ownership of house	3.17	7.04	-17.55*	2.92	-	.9D84	8.71	2.14
Type of house	-.7506	-7162	1.97*	1.01	2.08	-.2653	2.31	1.59***
Education	-.2294	.4204	-.3890	.1819	-.6415	.4908	3.95	.3107
Property tax	4.73	4.65	-4.03	-9.41*	-1.35	4.69***	-4.96	-
Constant	8.59	8.31	45.68*	6.87	42.31	12.57***	-20.35	11.06**
r²	0.10	0.06	0.09	0..08	0.13	0.07	0.04	0.17
Observations	102	106	106	107	39	327	207	207

Level of significance :   at 99% probability   ***

                     at 95% probability   **

                     at 90% probability   *

CHAPTER - VII

PRICING SIMULATIONS

CHAPTER VII
PRICING SIMULATIONS

7.1   **Introduction**

Under the prevailing conditions of mounting losses by the agencies providing water supply and sanitation services, the pricing becomes a major issue. While lower pricing obviously results in low revenue, as is the case now, the higher pricing results in low collection and lower growth of network and thereby resulting in low revenue. Hence a judicious pricing of the services taking into account the WTP is a necessity. The situation calls for a simulation model for the pricing and financing; however, constraints are affordability and equity limiting financial self-sufficiency. An attempt is made in the present chapter to describe the preliminary version of the model, its data requirements and sample results obtained for two cities - Surat and Solapur.

7.2   **Price Sensitivity**

The response of consumers to the increase in price could be observed through either one or both of the following :

i)   by the decrease in the rate of new connection .

ii)   by increase in arrear accumulation

These factors directly affect the revenue and thus the performance index. These two factors are taken into account in the model through rate of growth of house-connections and the collection performance. The demand sensitivity in terms of percentage connections is analysed with the help of the probit technique, a probabilistic estimation.

In general, as the monthly tariff increases, the proportion of connection decreases. The Probit analysis is used to throw light on the relation between monthly tariff and the growth in the number of connections. The findings of Probit runs are shown. graphically in figures 7.1 and 7.2. These results help in computing the expected

revenue collection with respect to the revised monthly charges. In other words, it gives an index for the elasticity of demand for connections. The threshold probability for accepting a household as connector is set at 0.3 or 0.4 depending upon city characteristics. It can be observed that the probability of getting connected decreases faster as the tariff increases. The probability in the other category of Improvement of existing services also decreases but at a relatively faster rate. For this category, the probability can be interpreted as the likelihood of collection. Figure 7.1 shows that Surat and Solapur have positive tail, with numbers in the highest price level.

7.3 Simulation Model

A model is developed on the simple principles of revenue and expenditure accounting. On revenue side, we use a simple formula:

Revenue = No. of connections x Tariff x Collection factor.

On the expenditure side, the capital costs are annulated at 15% and accounted every year.

It offers the planners and financial institutions a tool to examine the effect of various parameters and options available under a set of assumptions and thereby help the user choose an optimal (most appropriate) strategy. It uses the results of CVM analysis as a base for its frame. The objectives of the simulation model are:

i) to assess the possible implications of various investment options

ii) to arrive at a pricing which makes the institution self sufficient

iii) to test the affordable improvement level, and

iv) to assess the level of financial assistance required and consequent Internal Rate of Return (IRR) for the viability of the project.
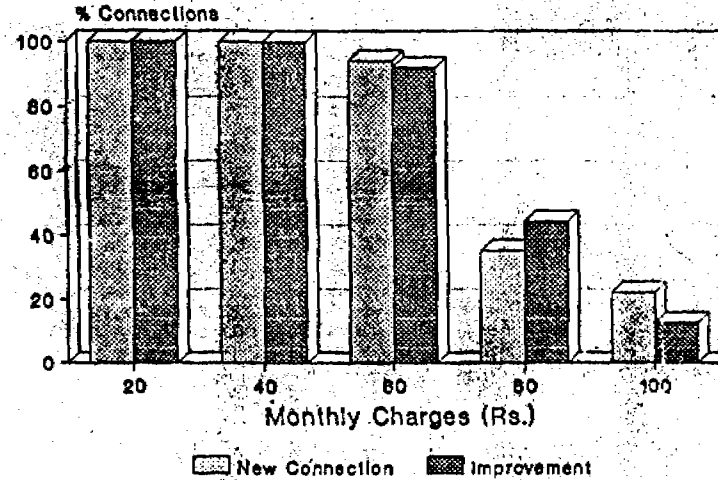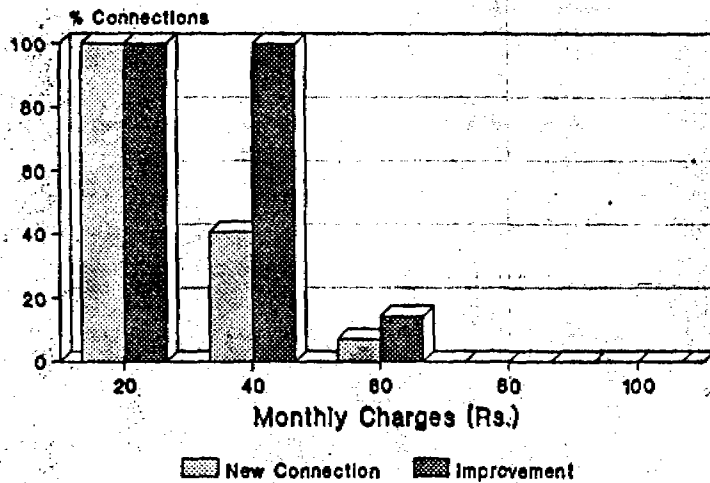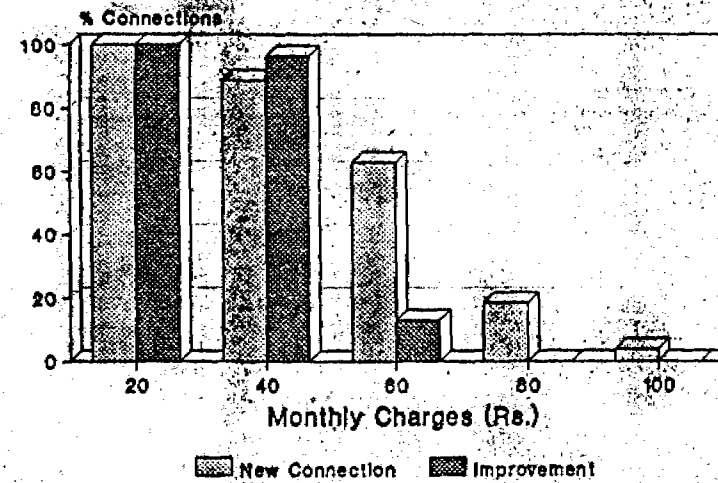
City - Solapur
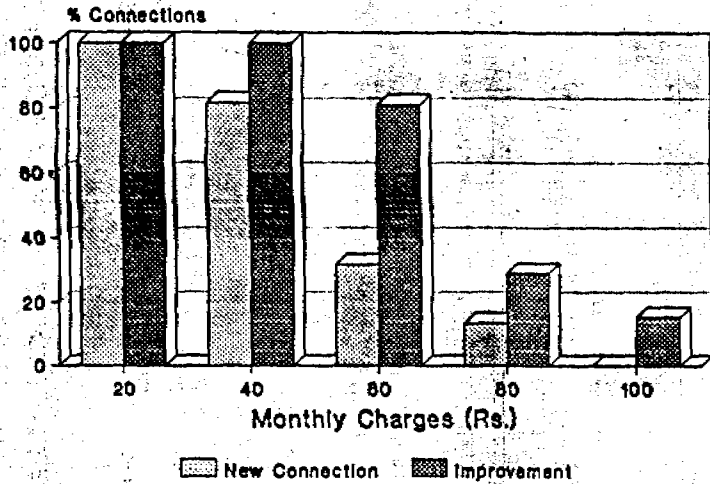
City - Surat

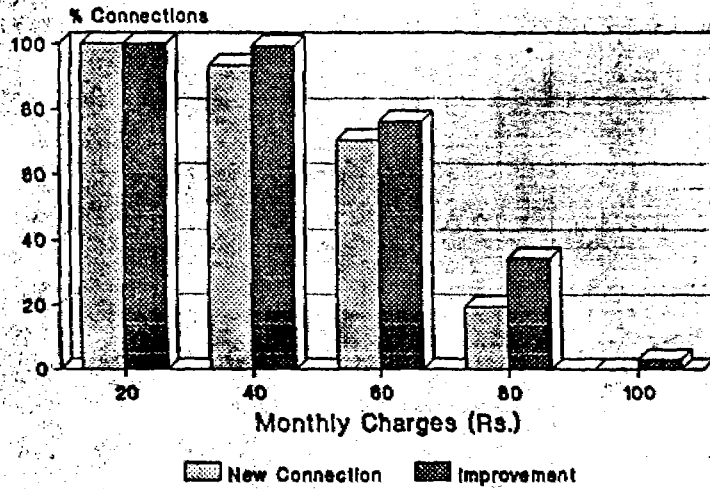## FIG. 7.1 : PROPORTION OF CONNECTIONS

City - Ralpur

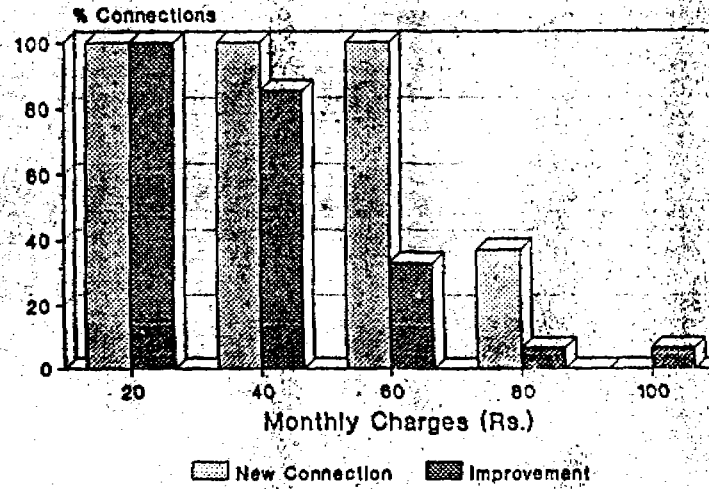# City - Visakhapatnam

City - Lucknow

City - Delhi

FIG. : 7.2 PROPORTION OF CONNECTIONS

City - Madras
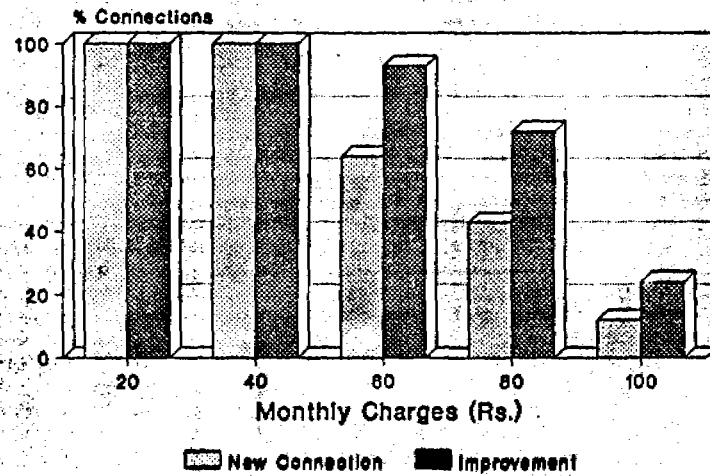
The simulation model developed is presented schematically in figure 7.3. It shows various inputs through secondary sources and other input through household CVM analysis. The options available and the output features are also shown. This model has a link with the chapter VI using rational value of WTP by the CVM analysis as the threshold limits. Time horizon is taken to be 20 years. The base year is taken as 1995. It is developed in the familiar Lotus 1-2-3 platform covering both water supply and sewerage services, (WS can be operated independently of SW).

Table 7.1 : Consumer Afforability (WTP)

Revenue Source	Surat			Solapur		
	Present	Feasible	Improve	Present	Feasible	Improve
Water Supply						
Capital charges	1000	1000	700	1000	1000	1900
Monthly charges	20	40	20	25	50	35
Sewerage						
Capital charges	950	-	600	100	-	750
Monthly charges	15	-	15	25	-	30

The actual revenue and expenditure figures in the base year are used to check the simulation. Obviously, it is not possible to simulate accurately the actual revenue figures using simple formulae. In order to eliminate such discrepancies, calibration constants are used. These constants have to be adjusted during the calibration leading to a better fit. To judge the "goodness of fit", we have incorporated X^2 index calculations. Low values of X^2 show a good fit.

7.4 **Following Options are provided**

7.4.1 **Year of Improvement**

Within the span of time horizon we can use 0-20 as valid entries. Choice of (zero) means improvement is in the base year. Choice of

number more than 20(twenty) means no improvement is hypothesised. Accounting of expenditure starts from the year given in this option but revenue connected with this decision starts after 2 years. New rates which may be exploited will be levied superceding the earlier rates under normal growth.

7.4.2 Revision of Rates

This parameter is available for both revenue and expenditure. The revised rates are effective from the year opted. The effect of multiple revisions during the planning horizon is obtained by cumulating the effects.

7.4.3 Collection Factor

This highly sensitive parameter is normally given as percentage. The two revenue heads viz., Water charges and water tax stand reduced to the extent of this factor. The connection charge remains unaffected. Any increase in this is to be accompanied by proportionate increase in expenditure.

7.5 Input Data

The interim report contains several inputs required for the model. In addition to this source, some complementary information was collected from the agencies. Inspite of the best efforts, there are certain data limitations on the sewerage services. Figure 7.3 shows schematically the broad input categories and table 7.2 presents input data to the model.

It may be recalled that the chapter VI presents the consumers' affordability in terms of WTP. This forms the basis for domestic connection tariff in the base year. This holds good with both WS & SW services. The analysis on Industrial Survey presented in Chapter VI gives the affordable WTP for both the services. In addition, the Chapter III gives the average industrial consumption of water. The

CITY PARAMETERS
Population
Household
Area

REVENUE
-Water Tax
-Surcharge
-Collection Factor
-Rebate/Discount
-Bonds
-Loan/Grant
-Opportunity cost
 of time

EXPENDITURE
-Establishment
-Salaries/Wages
-Source augment
-O&M Charges
-Bulk Purchase

INPUTS

Household CVM Analysis

From Household Model

-Consumer Afforda-
 bility
-Optimal WTP
-Estimated
 connections
-Demand
-Attitude

SIMULATION MODEL

SIMULATED RESULTS
-Connectors
-Charge Rate
-Demand
-Revenue

Industrial Features

From Industrial Data

-Tarrif
-Connections
-Demand

OPTIONS
-Pressure
-Quantity
-Quality
-Augmentation
 Network

Commercial Features

From Commercial Data

-Tarrif
-Connections
-Demand

VIABILITY
-IRR
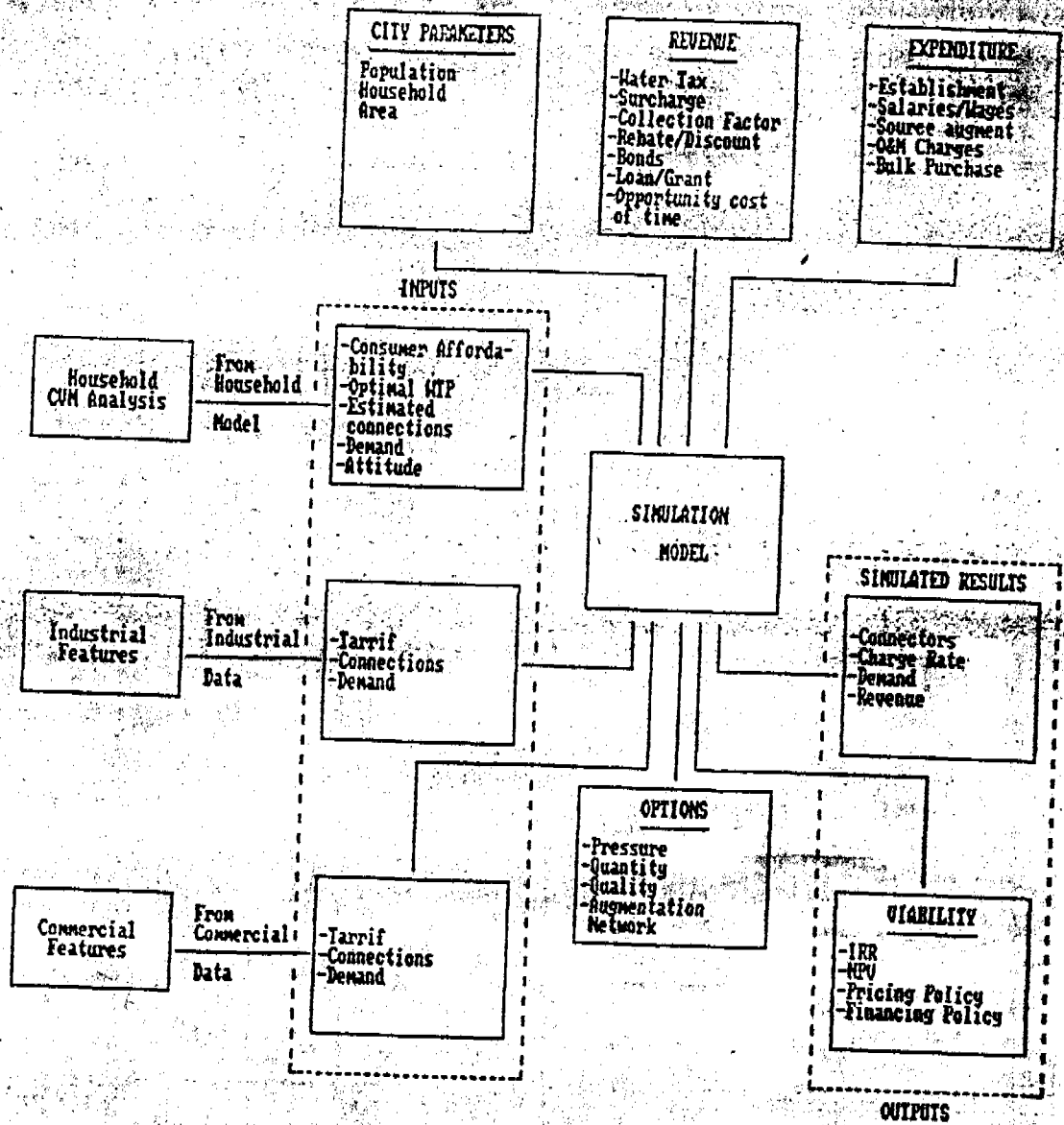-NPV
-Pricing Policy
-Financing Policy

OUTPUTS

Figure 7.3 : Schematic for the Simulation Model

tariff unit for industrial use is Rs.per KL. The secondary data inputs are grouped into following blocks:

i)   City characteristics
ii)   WS/SW network
iii)   Revenue
iv)   Expenditure

The city population and the growth serve as an index for WS demand. The total difference between the households and the hhs with connections, leads to computation of percentage of non-coverage by the service. These figures are used in computation of acceleration of the growth of network under improvement option. It also gives us the rate of decrease in LPCD as the coverage becomes wider.

The data items 'number of connections' and the observed 'growth rate of network' are directly used in computations of revenue. In certain towns like Raipur, it was not possible to obtain a split between domestic and non-domestic (industrial) connections. In such cases it is proposed to use appropriate percentages by suitable modifications depending upon the characteristics of the city.

The revenue data used in the model are the tariff, tax, rates, the revenue collected (for few years) and the collection performance. Collection performance is dynamic, varying with respect to time. This assumption itself has a cost which is accounted under expenditure. Using the short-time series we compute the growth rate of revenue as on base year. All these details are taken from the iterim report.

The data on expenditure (like capital cost, network expansion costs, O&M costs) is taken from the interim report and the other documents collected from the agencies. The annulated costs spread over the life of the project are used since the benefits from the investments are

spread over a period. In case of improvement to the system like for better pressure or more quantity, an item called special cost of improvement is provided. This is worked-out outside the model.

Table 7.2 Input Data for the Simulation Model

Description	Surat	Solapur	Raipur	Vizag	Bhubaneswar	Lucknow	Madras	Delhi
Population ('000)	1499	604	439	752	411	1619	38.41	7207
Households ('000)	279	105	80	160	86	282	798	1441
Area (Sq.Km)	112	25.33	55.03	31.98	92.91	114.11	170.03	360.55
Growth rate population (%)	6.79	1.69	2.65	2.56	6.50	5.85	1.60	3.97
Grwoth rate households (%)	12.23	1.78	2.11	3.64	9.34	6.88	2.68	5.10
Water Supply								
Connections (Dom)	113690	32751*	25179	21000	36064	112372	-	999334
Connections (Non-Dom)	1820	3860	-	318	1042	-	-	2480
Transportation								
Coverage (%)	40	80	70	75	75	98	-	90
Connect charge (Dom) (Rs.)	100	NA	NA	NA	NA	NA	NA	NA
Water charge (Dom.) (Rs.)	40	50	NA	5.00 per Kl	0.72 per kl	0.50 per kl	1.00 (above 30 kl)	0.50 (upto 20 kl)
Connect charge (Ind.)	3000	NA	NA	NA	NA	NA	NA	NA
Collection factor	0.25	52.7*	82.3	84.6*	94.8	73.9*	.	73.2*
Expenditure Parameters								
Capital cost	200							
Network cost/km	34000							
O&M cost (Lakhs)	800.00	529.10	165.74	572.77	NA	781.00	4091.00	10842.00
Present WS Expenditure (Rs. Lakhs) O&M	800	529.10	165.74	572.77	NA	781.00	4091.00	10842.00
Network Expenditure	388	-	-	-	-	-	-	-
Revene Parameters								
Revenue by water charge (Rs.lakh)	199	20	-	848.00	-	159.00	-	7064.00
Revenue by water tax (lakh)	39	383	77	102.33	155.25	625.11	-	-
Present WS revenue (Lakhs)	237							

7.6   The Results

The objective of self-sufficiency along with the constraints of affordability and financing options suggest various scenarios of developments which can be validated. The scenarios necessarily should include present loss-making situation, and improvement scenario refered to in the earlier chapters. Presently, investigation is made into the following two scenarios.

i)   Present Scenario

ii)   Feasible Scenario

Accordingly the present status in Surat is revenue falling short of expenditure. The revenue is Rs.235 lakhs while expenditure is around Rs.800 lakhs which is nearly 4 times to revenue in the water supply sector only. Once the sewerage sector is added, the expenditure stands at 16 times the revenue. But, Surat in view of it being on the river Tapi and also due to its rich industrial base can really do better. As revealed by the household survey, the consumers are ready to pay higher than the present prevailing rates. The consumers' affordability is tabulated in table 7.1. The present scenario simulates these features. It has negative NPV; and, IRR cannot be worked out as all the years the city registered losses. A sample output containing input and outputs of the model for Surat city is presented in annexure 7.1. The major parameters obtained through simulations are contained in tables 7.3 to 7.6.

Table 7.3 : Revenue parameters used as input

Item	Surat		
	Present	Feasible	Improve
Water Supply			
Connection Charges (Dom.)	1000	2000	3000
Water Charges (Dom.)	25	60	100
Water Tax	5	25	40
Revision (%)	70	60	55
Connection Charges	2500	5000	5000
Water Charges (Ind.)	15	150	250
Water Tax (Ind.)	5	40	100
Revision (%)	90	80	80
Sewerage			
Connection charges	500	500	500
SW charges	60	60	60
Revision (%)	80	80	80
General			
Collection factor	0.6	0.6	0.75

Table 7.4 : Expenditure Parameters

Item	Surat		
	Present	Feasible	Improve
Water Supply			
Annulated Cap. Cost	200	200	200
Network cost (Rs./connct)	550	700	700
O & M cost (Rs./Connct)	700	700	700
Cost Revision (%)	35	35	35
Special Cost of Improvement	-	-	3000
Addl. O & M Cost	-	-	1500
Annulated Cap. Cost	-	-	-

Table 7.5 : Self-Sufficiency Indicators

Indicator	Surat		
	Present	Feasible	Improve
NPV (Rs. Lakhs	-2.06	0.82	0.80
IRR (%)	-	0.22	0.21

Table 7.6 : Financial Investment (Feasible Scenario)

Source of revenue	Surat
Own	2406
Grants	700
Loan	-

The feasible scenario is an attempt to determine the tariff policy which gives postitive internal rate of return. Table 7.5 indicates the possibility of an IRR of 0.22 with the NPV of Rs.0.82 lakhs. The details of this policy are outlined in Table.7.3. It gives the base year charges under the three heads considered. The water charges are Rs.60 per month, water tax is Rs.25 per month and the charges for new connection is Rs.2000. The last one is one time charge. A revision of 60% for every fourth year is assumed. Industrial charges are 2.5 to 3 times higher than the domestic charges. On the sewerage side the charges are as follows: Sewerage tax is Rs.650 per annum while the sewerage charges are at nominal Rs.60 per month A revision again at every four years at the rate of 80% is hypothesised.

The goodness of fit, the X^2 criteria makes sense only in present scenario where we try to simulate observed revenue and expenditure figures. In other scenarios, it will be high and is not relevant.

Expenditure figures simulated are tabulated in table 7.4. They match the base year figures in present scenario while the feasible scenario shows change in network expenditure from Rs.550 to Rs.700 per connection. A revision of 35% in every two years is hypothesised. The investment options for this scenario are presented in table 7.6. It does not assume any loans but grants of Rs.700 lakhs in the base year. We can treat it as a loan by activating the loan option. The scenario attempts to generate sufficient own revenue in the time horizon by revising the charges rationally. However, the present scenario does not even require grants.

COMPUTATION FORMULAE USED IN THE SIMULATION MODEL.

1. **CONNECTIONS PROJECTION :**

(a) Natural Growth :

New connections$_t$ = Base year connections *

* (growth rate of connections/ 100)

* no. of years

(b) On improvement :

New additional connections$_t$ = Annual target of connections$_t$

2. **REVENUE DUE :**

(a) <u>Connection Capital Charges</u> : (in Lakhs)

Revenue by connection charge$_t$ =

New connections in that year$_t$ *

Unit charges$_t$ /10^5

Unit charge$_t$ = Base year rate   if t < t*

Rate on improvement   if t $\geq$ t*

(b) <u>Water charges</u>

Domestic Revenue by water charges =

Current connections * water charge rate *

((1 + revision percent/100)^ sr. no of the revision)

where Water charge rate$_t$ =   Rate on improvement   if t $\geq$ t*

Base rate   if t < t.

Industrial revenue by water charges$_t$ =

Current connections$_t$ * water charge rate$_t$ *

((1 + revision percent/ 100)^ sr. no. of the revision$_t$)*

Average consumption * 12/10^5

(c) <u>Water Tax :</u>

Revenue by water tax$_t$ = Current connection$_t$ *

Water tax rate$_t$ * ((1 + revision percent/ 100)^

Sr. no. of the revision$_t$) * 12/ 10^5

Water tax rate$_t$ =   Rate on improvement if t $\geq$ t.

Base year rate   if t < t.

(d) **Total Revenue :**

$Revenue_t$ = Domestic charges with normal growth$_t$

+ Domestic charges with improvement$_t$

+ Non - domestic charges with normal growth$_t$

+ Non - domestic charges with improvement$_t$

Note : This formula applies all the three heads of revenue.

3. **Total Collection of Revenue :**

$Collection_t$ = connection charges$_t$ +

(water charges$_t$ + water tax$_t$) *

Collection performance

4. **Expenditure Projection :**

(a) Network (Capital recurrent) :

Network expenditure$_t$ =

New connections in the year$_t$ * Network

rate * ((1 + revision rate/100)$^\wedge$ Sr. no. of the decision$_t$)/105

where Network rate$_t$ =   Rate on improvement   if $t \geq t$

                  Base year rate if $t < t$

(b) **O & M expenditure**

O & M expenditure$_t$ =

Current connections$_t$ * O & M rate$_t$ *

((1 + revision rate/ 100)$^\wedge$ Sr. no. the decision$_t$)/ 10^5

where O & M rate$_t$ = Rate on improvement if $t \geq t^*$

                Base year rate if $t < t$.

5. **Financial Viability :**

(a) Debt repaid

        $Debt\ repaid_t$ = Loan amount * Annuity factor

(b) Net revenue

Net revenue$_t$ = Total revenue collection$_t$

        - Debt repaid$_t$

        - Expenditure$_t$

SAMPLE OUTPUT

SIMULATION MODEL FOR WATER SUPPLY & SEWERAGE
HUDCO SPONSORED STUDY
GENERAL REPORT
City :   SURAT

Present			Growth rates		
Population('000,1991)	:	1499	Population(%)	:	6.79
Households('000)	:	279	Households(%)	:	12.23
City Area(Sq.Km)	:	112	Proj. Population(1993)	:	1709
Water Supply Sector					
Connections(Dom.)	:	101690	Connections(%)	:	6.18
Connections(Ind.)	:	1782	Connections(%)	:	3.31
Supp. rate(LPCD)	:	130	Connect on Improv(Domst)	:	3000
Ind. Consumption(KL)	:	20	Connect on Improv(Ind)	:	250
Coverage(%)	:	40	Ind. Consumption(K	:	0
Sewerage Sector					
Connections		43000	Connections(%)	:	6.44
Network length		1000	Network Exp rate	:	
Capa. Utilization			Network Exp rate	:	
Network length		3000			

Revenue Assumptions		Expenditure Assumptions	

EXISTING RATES		**PRESENT SYSTEM**	
Domst Connect Ch. (Rs) :	2000	Annu. Capital Cost (lakhs):	200
Domst Tariff (Rs) :	60	Network Cost Rs/Conn :	700
Domst Water Tax (Rs) :	25	O&M Cost Rs/Conn :	700
Domst Revision (%)	60	Cost Revision (%) :	35
Indust Connect Ch. (Rs):	5000	Cost Collect Rs/Conn :	2
Indust Tariff (Rs/KL) :	150	Cost Metering Rs/Conn :	25
Indust Water Tax (Rs) :	40		
Indust Revision (%) :	80		
Loan received :	0	Disbursement installments	5
Period of Revision :	4	Period of Revision :	2
IMPROVE PRESSURE/QUANTITY/QUALITY			
Domst Connect Ch. (Rs) :	3000	Year of Improvement :	25
Domst Tariff (Rs) :	150	Annu. Capital Cost (lacks) :	650
Domst Water Tax (Rs) :	40	O&M Cost/Connect :	1500
Indust Connect Ch. (Rs):	5000	Cost of Improv (lacks) :	500
Indust Tariff (Rs/KL) :	300	**BURDEN PARAMETERS**	
Indust Water Tax (Rs) :	100	Repayment Rate (%) :	15
Add to Collect factor:	0	Repayment Period (Yr) :	15
Collection factor :	0.6	Annuity Factor :	0.17
Figures to be Simulated (WS)			
Base year Water Charges	199	Base year Network Exp :	306
Base year Water Taxes :	39	Base year O&M Exp :	800
WS Revenue growth (%)	9.5	WS O&M Expend growth (%)	16.5
Calibration constants			
Base year Revenue	0.9	Base year Expenditure	1
Revenue growth :	3.5	Growth Network Expend :	0.9
		Growth O&M Expenditure :	30

Loan disburesment:·

Years	1	2	3	4	5	6
Amount	0	0	0	0	0	0

Revenue Assumptions   Expenditure Assumptions

EXISTING   PRESENT SYSTEM
Existg Connectn Charge: 500 Network Cost Rs/Conn   :   2100
SW Charge(Rs   60 O&M Cost/Connect   :   2100
SW Tax(Rs)   650 Oth. Capital Cost   :   686
Revision (%   :   80 Revision (%)   :   20
          Figures to be Simulated (SW)
Base year SW Charges   0 Base year Network Exp   :   912
Base year SW Taxes   164 Base year O&M Exp   :   963
          Calibration constants
Base year Revenue   1 Base year Expenditure   1
Revenue growth   :   1.05

                                  Growth Network Expend   :   1.1

Feasibe Scenario
SIMULATION MODEL FOR WATER SUPPLY & SEWERAGE
HUDCO SPONSORED STUDY
SIMULATION FIT
City :   SURAT

Data Items	Observed	Simulated	(O-S)^2/O
Water Supply			
Connect charges		1005.00	
Water charges	199	955.63	2876.840
Water tax	39	38.14	0.019
Network expenditure	306	315.63	0.303
Other Cap. expenditure	200	200.00	0.000
O&M Expenditure	800	724.30	7.162
WS O&M Expend growth(%)	16.50	15.22	0.100
WS Revenue growth(%)	9.50	18.64	8.801
SEWERAGE			
SW charges	0	16.25	0.000
SW taxes	164	176.09	0.891
Network expenditure	912	903.00	0.089
Other Cap. expenditure		30.60	0.000
O&M Expenditure	963	993.30	0.953
SW O&M Exp.rate(% pa)	0	33.60	0.000
SW Revenue rate(% pa)	0	35.40	0.000
Goodness of fit (Chi-squared)			2.90E+03

Feasible Scenario
SIMULATION MODEL FOR WATER SUPPLY & SEWERAGE
HUDCO SPONSORED STUDY
FINANCIAL VIABILITY

City :   SURAT   Unit   :   Rs.Lakhs

	Debt Servicing	Water Sector Expend	Revenue	Sewerage Sector Expend	Revenue	Status
0	0.00	1239.93	1998.78	1896.30	407.34	-730.12
1	0.00	1234.77	1150.69	1984.50	531.50	-1537.07
2	0.00	2068.90	1185.11	2540.16	548.30	-2875.66
3	0.00	2505.18	1219.52	2698.92	565.10	-3419.47
4	0.00	4017.27	3850.26	3429.22	805.50	-2790.73
5	0.00	4698.86	3961.76	3556.22	816.70	-3476.63
6	0.00	7326.13	4073.25	4496.08	833.50	-6915.45
7	0.00	8371.31	4184.75	4724.70	850.30	-8060.95
8	0.00	12796.66	14124.14	5943.97	1269.58	-3346.91
9	0.00	14376.46	14492.38	6126.87	1280.78	-4730.16
10	0.00	21654.88	14860.62	7681.44	1297.58	-13178.13
11	0.00	24015.48	15228.85	8010.65	1314.38	-15482.90
12	0.00	35761.53	52756.02	10007.82	2055.64	9042.30
13	0.00	39255.98	53990.44	10271.19	2066.84	6530.11
14	0.00	57920.74	55224.86	12799.48	2083.64	-13411.71
15	0.00	63053.55	56459.29	13273.53	2100.44	-17767.36
16	0.00	92331.93	198228.65	16497.11	3421.28	92820.89
17	0.00	99821.90	202419.89	17065.97	3438.08	88970.10
18	0.00	145249.47	206611.13	20934.26	3449.28	43876.68
19	0.00	156117.83	210802.38	21616.90	3466.08	36533.73
20	0.00	225942.25	747291.08	26759.45	5830.14	500419.52

NPV	81624.39
IRR	0.22

Investment Plan
Total Amount(Rs.lakhs)   :

Loan	:	0.00	Own	:	2406.12
Grant	:	700.00	Public	:	0.00

Feasible Scenario
SIMULATION MODEL FOR WATER SUPPLY & SEWERAGE
HUDCO SPONSORED STUDY
BALANCE SHEET (Water Supply)

City :   SURAT   Unit   :   Rs.Lakhs

Year	Expenditure Capital	O&M	Water Connect	Water Charges	Water Tax
0	515.63	724.30	1005.00	955.63	38.14
1	238.12	996.65	122.50	988.68	39.51
2	321.46	1747.45	122.50	1021.73	40.88
3	321.46	2183.72	122.50	1054.78	42.25
4	433.96	3583.31	122.50	3655.57	72.18
5	433.96	4264.90	122.50	3764.82	74.43
6	585.85	6740.27	122.50	3874.08	76.68
7	585.85	7785.46	122.50	3983.33	78.92
8	790.90	12005.76	122.50	13867.04	134.60
9	790.90	13585.56	122.50	14231.58	138.30
10	1067.72	20587.17	122.50	14596.12	142.00
11	1067.72	22947.77	122.50	14960.65	145.70
12	1441.42	34320.12	122.50	52385.22	248.30
13	1441.42	37814.57	122.50	53613.54	254.40
14	1945.91	55974.83	122.50	54841.86	260.50
15	1945.91	61107.64	122.50	56070.18	266.61
16	2626.98	89704.95	122.50	197651.79	454.36
17	2626.98	97194.92	122.50	201832.93	464.46
18	3546.42	141703.05	122.50	206014.07	474.56
19	3546.42	152571.40	122.50	210195.21	484.66
20	4787.67	221154.58	122.50	746342.10	826.47

Feasible Scenario
SIMULATION MODEL FOR WATER SUPPLY & SEWERAGE
HUDCO SPONSORED STUDY
BALANCE SHEET (Sewerage)

City :   SURAT   Unit   :   Rs.Lakhs

Year	Expenditure Capital	O&M	Sewerage Connect	Sewerage Charges	Sewerage Tax
0	903	993.30	215.00	16.25	176.09
1	945	1039.50	225.00	27.00	279.50
2	1209.6	1330.56	240.00	28.80	279.50
3	1285.2	1413.72	255.00	30.60	279.50
4	1632.96	1796.26	270.00	32.40	503.10
5	1693.44	1862.78	280.00	33.60	503.10
6	2140.992	2355.09	295.00	35.40	503.10
7	2249.856	2474.84	310.00	37.20	503.10
8	2830.464	3113.51	325.00	39.00	905.58
9	2917.555	3209.31	335.00	40.20	905.58
10	3657.830	4023.61	350.00	42.00	905.58
11	3814.594	4196.05	365.00	43.80	905.58
12	4765.630	5242.19	380.00	45.60	1630.04
13	4891.041	5380.15	390.00	46.80	1630.04
14	6094.990	6704.49	405.00	48.60	1630.04
15	6320.730	6952.80	420.00	50.40	1630.04
16	7855.765	8641.34	435.00	52.20	2934.08
17	8126.654	8939.32	450.00	54.00	2934.08
18	9968.695	10965.57	460.00	55.20	2934.08
19	10293.76	11323.14	475.00	57.00	2934.08
20	12742.59	14016.85	490.00	58.80	5281.34

APPENDIX - I
A NOTE ON POLICY CONSIDERATIONS

1.1 **Introduction**

After detailed examination of the data (both secondary and primary) for the eight cities, it is evident that the cities differ widely in Systems and policies being adopted in the management of Water Supply and Sewerage (WS&SW) services. And yet, by all means, the situation in most of the cities is one of pessimism; however as revealed by the WTP, there is considerable room for improvement. In this connection, an attempt is made to highlight the important steps needed to overcome the deficiencies to improve the system. These are as follows :

1) Level of the Service/ Level of satisfaction
2) Performance Indicators
3) Institutional rigidities
4) Low tariff and failure to take cognizance of cost recovery from the investments

1.1.1 **Level of the Service/ Level of satisfaction**

Presently, the consumers are not satisfied by the level of the service. While both the WS & SW services are not well spread, households are not satisfied even where the services are available. In the case of water supply, inadequate supply, low pressure are the much evident phenomena; the Sewerage service, is also far from adequate in its coverage. The most important factor responsible for this situation is the poor network development which is due to the capital intensive nature of the services. While the systems (Say, WS) designed is of such capacity that it cannot cater to everyone satisfactorily, further additions to the systems' growth are piecemeal and marginal and do not really add significantly to the same. The result is dwindling per capita service. In the

case of SW, in cities like Vizag the service is not spread due to the prohibitive capital costs, despite concerted efforts being made.

1.1.2   **Incidence of User Charges on the hh Incomes**

It is proved that the payment made for the services constitutes a low percentage of the hh income. The user charges for water supply consist of less than 1% of the monthly income. However the WTP is 1% for existing connections and extra 0.5% for improved connection. In either case, the incidence of user charges is considerably lower than the affordable limit. In the context of rising incomes, educational levels and increasing awareness for the better quality of the services, increased user charges are not likely to be resisted. What is more important is reliability of the services in terms of quantity and quality. Reliability of the service will result in better performance indicators. But, a break from the barriers of institutional rigidities is also needed for quicker network development and a breakeven in the sectors.

1.1.3   **Tariff Level and Cost Recovery**

While taxes on WS & SW services are low and stagnant in view of linking with the property's Annual rental value, the user charges (Tariffs) are also not at the optimum. The level of tariffs do not really reflect the cost of providing the service and therefore this has lead to deficit in the revenue compared to the expenditure incurred. Attempts to enhance the tariffs are rather poor or met with consumer resistance in view of the overall poor performance of the sector. The comparatively lower tariff against the mounting costs and the consequent subsidy are explained as follows:

WS : Differentials in Revenue and Expenditure Per Connection (1993-94)

(In Rs)

	Delhi	Madras	Lucknow	Surat	Vizag	Solapur	Raipur	Bhuban eswar
Revenue	328	128	132	188	6106	1101	512	458
Expenditure	730	2232	1582	755	3834	1718	540	543
Difference	-102	-1204	-1450	-565	2272	-617	-28	-95

WS : Differentials in Revenue and Expenditure Per Connection (1993-94)

(Per KL in Rs)
(Averages)

	Delhi	Madras	Lucknow	Surat	Vizag	Solapur	Raipur	Bhuban eswar
Revenue from User Charges	0.90	0.18	0.10	0.28	3.73	0.05	0.12	0.37
Expenditure	0.80	3.22	1.24	1.11	2.34	1.15	0.15	0.44
Subsidy or Difference	-0.11	-3.04	-3.04	-0.83	1.38	-1.10	-1.39	-0.07

Except in Visakhapatnam, none of the cities could experience a breakeven in the sector. This also shows that the boards and local bodies alike failed to give a good performance in the WS/SW sectors. This is a situation that needs immediate attention.

1.2   **Differential between WTP and True Costs (Annualized Cost)**

Quick (short term) measures have to be thought of as immediate remedial measures to prevent further downfall of the system.To improve the performance of the WS/SW sectors, complete overhauling of the systems need to be carried out. This itself requires capital fund flow which can be achieved by resorting to loans. But, this loan needs to be repaid and the true costs for repayment of loan are far higher than the user charges the consumers are willing to pay. If the O & M costs are included, the total

monthly charges would be even more. In this connection, an attempt is made to compare the average user charges being paid, the WTP and the true annualized costs for two cities: Solapur and Surat as shown :

Average Charges Per Connection (household)

(Rs. Per Month)

City	Present Payment (as per municipal record) (1)	WTP (as per survey) (2)	True annualized charges (as calculated from the given investment) (3)	Difference (Col.3 - Col.2) (4)
Solapur	24	66	174	108
Surat	6	42	117	75

It is very clear from the above Table that WTP is much lower than the annualized costs. Thus before complete overhauling of the system is carried out in order to increase the coverage, the reliability and quality of the existing service connections should be improved upon which will definitely reduce the gap between the WTP and the annualized charges. Only when this is achieved can augmentation to the existing system be thought of.

1.3.1　**Rational Utilization of the Resources**

What are the factors associated with the above phenomenon and whether this phenomenon should continue; and if so, for how long are the questions that are relevant for policy formulation. So far the differential between revenue and expenditure is met from the funds from either the general revenue or the grant or both. The commitment to make the system more efficient is one of the emerging issues today. In this context, it is not possible to run the system at such an inefficient level; particularly

since the WS and SW services are considered to be the most important ones for the human resource development. Hence long term measures have also to be considered in order to make the sector cost recoverable in the long run.

1.3.2   What should be the Funding Mechanism

The system's expansion to cope with the increased demand has to be supported by adequate funds. These funds are so far through HUDCO, LIC or Government or soft Lending by the International Agencies like the World Bank. In either case, it is a subsidized funding at low interest rates. These soft window sources have serious limitations (except HUDCO funding) in terms of their availability in the context of competitive nature of the capital markets. This calls for an efficient operation to attract funds from the market through equity/ bond/ debenture participation.

1.3.3   Who would Raise the Market Funds

Presently, the utility agencies are constrained by certain limitations. For instance,

a)   Municipal Acts do not provide sufficient powers to raise funds in the market compared to the Boards which are relatively better placed.

b)   Municipal Acts allow the investment of surplus funds only in the nationalized Banks where the return is much lower than the market rate investment in equity participation.

The above analysis indicates that the agencies cannot function within the existing institutional framework and hence there is need for an appropriate metamorphosis in favour of a dynamic, accountable result oriented system, which could be in the BOO/ BOT framework.

1.4   Private Provision of Public Infrastructure:

It is assumed that the private operator in the BOO/ BOT framework would be accountable for the service provision with high stakes in the performance. For instance,

- A BOT prototypical urban infrastructure model project could have a financing structure which requires debt financing, equity financing, contribution from the local government and funding by HUDCO.

- The Government, the HUDCO and the private consortia need to have an identity of interest in terms of operations, equity and tariff rate setting mechanism.

- Risks : There are certain risks involved in a BOT operation. These risks may need to be tackled together by the government, HUDCO and the BOT operator. Some of the obvious risks leading to cost escalation are related to land acquisition. This type of risk and the possible damage by such a risk could be avoided by acquiring the land beforehand. The other risks involved in the project are listed as follows:
  a)   Development risk
  b)   Construction risk
  c)   Operations risk
  d)   Financial risk (Loan repayment risk)
        i)   Domestic Currency financing
        ii)   Domestic/ foreign currency financing
  e)   Legal risk

Guarantees : Guarantees on reciprocal basis may also need to be ensured. For instance the performance guarantee, timely completion of the project and transfer at the end of the tenure are to be given by the BOT operator. HUDCO has to ensure periodic appraisals by itself, fund flow, control on cost overruns and timely remittance of the dividends to the shareholders. It would also be necessary that the performance of the BOT scheme be rated by a reputed credit rating institution from time to time. From the government's side, it is essential to provide guarantees against the political risks.