WATER CONSUMPTION, USE, AND PROBLEMS IN DDA FLATS OF DELHI

A total of 2285 respondents provided answers to the questionnaire from different areas of Delhi. The largest number of respondents was from the West with 644 forms filled in (28.2%). This was followed by the East (617 forms – 27.0%), the North (514 forms – 22.5%), and the South had the smallest number (510 forms – 22.3%). The schedule contained a number of questions relating to total water consumption, various purposes for which water was used, the source of water, income levels, type of housing with amenities and utilities, satisfaction levels, and sewerage problems. The tables and graphs given below/in the Appendix provide an overall picture of the views of the respondents, both at the aggregate as well as the zonal levels.

INCOME

DDA flats are categorised into **Janata, LIG** (Low Income Group), **MIG** (Middle Income Group), **HIG (**High Income Group), and **SFS** (Self Financing Scheme). It is believed that this gradation helps different income groups to occupy different kinds of flats based on their paying capacity, with the economically weaker sections taking the Janata and LIG flats. In this survey, households were categorised into rich, middle, and poor groups based on whether their monthly earnings were over Rs.10,000, between Rs.5-10,000, or less than Rs.5,000 respectively. This was done taking into consideration that economically weaker sections in Delhi are reported to earn an average of Rs.2,000 per month. When income was correlated against occupation of flats (Fig.1), it was seen that only 40% of the Janata flats were occupied by the poor, while 81% of the LIG families were of middle and rich groups. It was only in the East (Fig.1-E) where the poor appeared to have greater access to Janata flats

(60%), while in the South (Fig.1-S) the rich had almost completely taken over HIG (88%) and SFS (86%) housing.

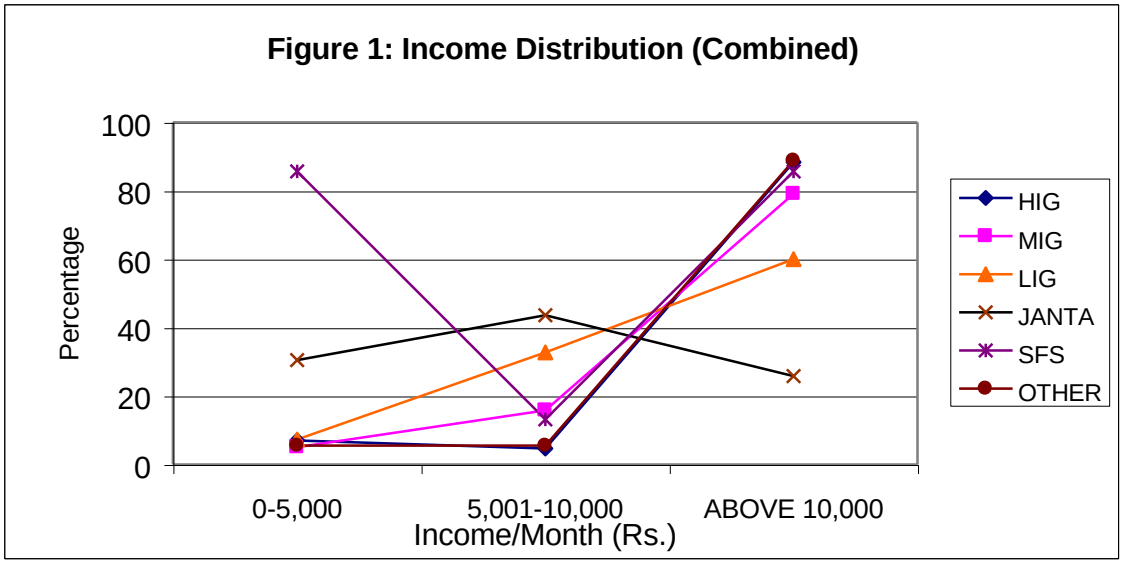
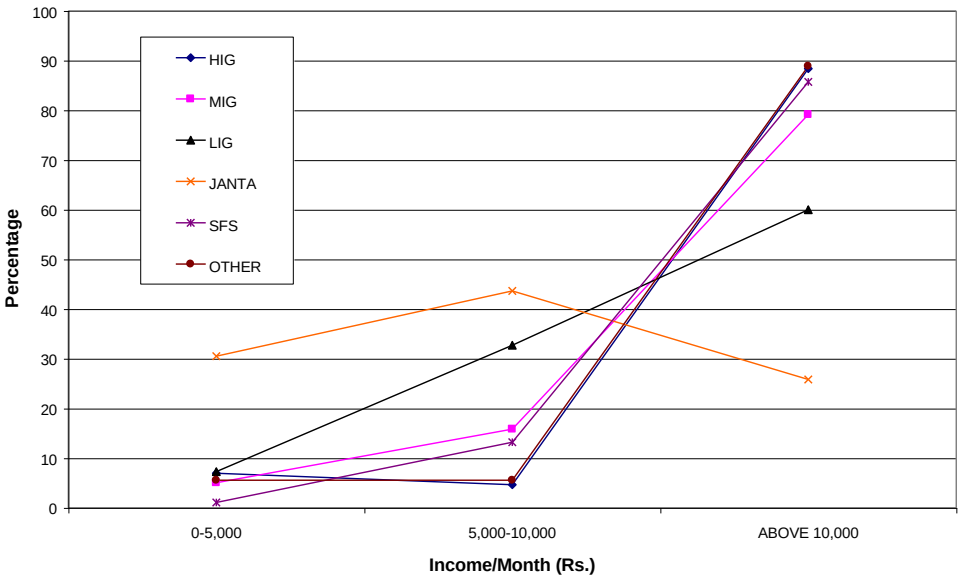
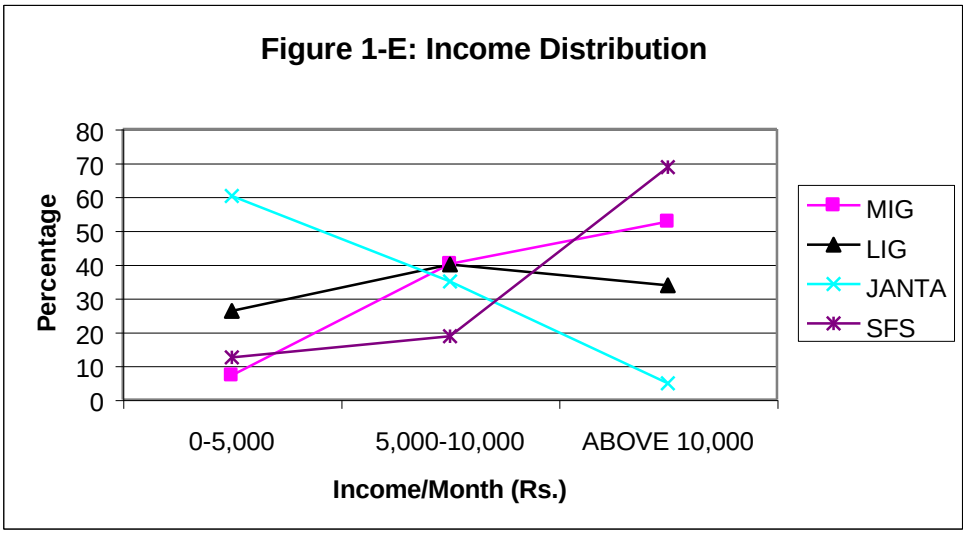


Figure 1-S: Income Distribution (South)



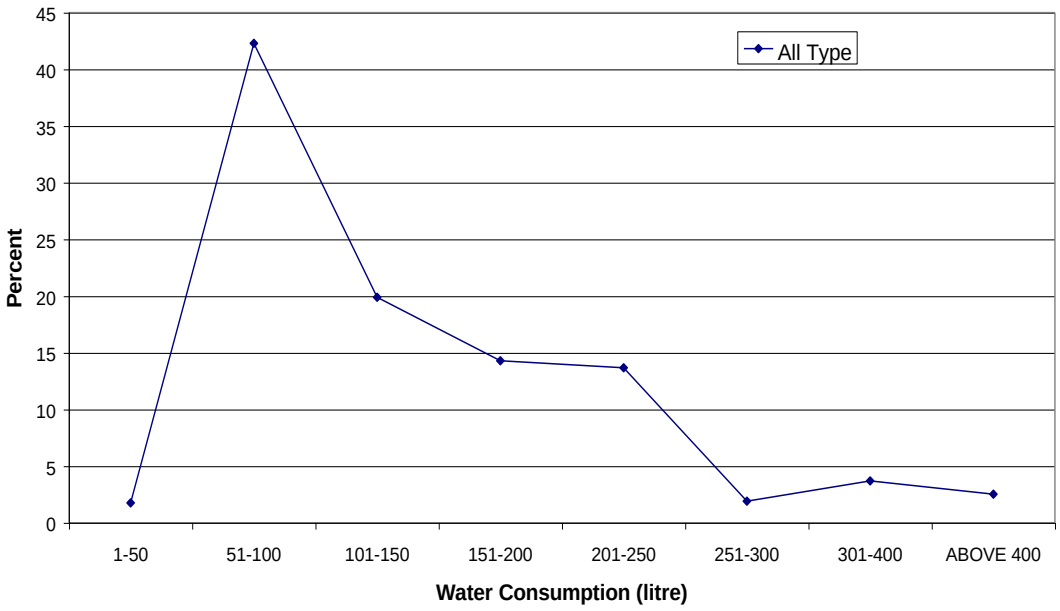


PER CAPITA CONSUMPTION

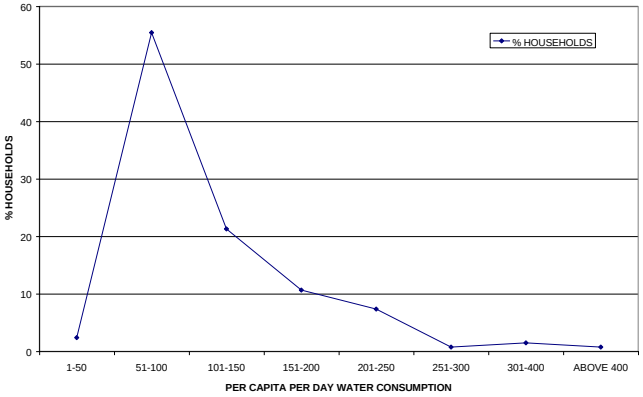
Average Per capita consumption of water as reported by the respondents appears to vary between 50 to 200 lpcd (litres per capita per day) depending upon the area and the income levels of the respondents. Thus, for the total sample (Fig.2) 42.3% of the respondents were reporting a consumption level less than 100 lpcd, while 62.2% were consuming less than 150 lpcd. These figures varied significantly across zones. Thus, while the North and the West had somewhat comparable figures (Figs.2-N and 2-W), in the East the number of households consuming less than 100 lpcd went up to 58% (Fig.2-E) while in the South it went down to 36% (Fig.2-S). Except in the East, where 79% were consuming less than 150 lpcd, in the other zones roughly three-fourths of the respondents were consuming less than 200 lpcd. These figures obviously have something to do with the affluence of the respondents in the different zones, as discussed above. This is further supported when the total consumption per household is correlated against the type of flat (Fig.3). The Janata and LIG flats have a total consumption averaging less than 300 litres, while the MIG and SFS households average between 301-500 litres, and the HIG flats consume 501-1000 litres. This

pattern is repeated in all the zones except in the East (Fig.3-E) where peak consumption, even for HIG flats, does not cross 500 litres.

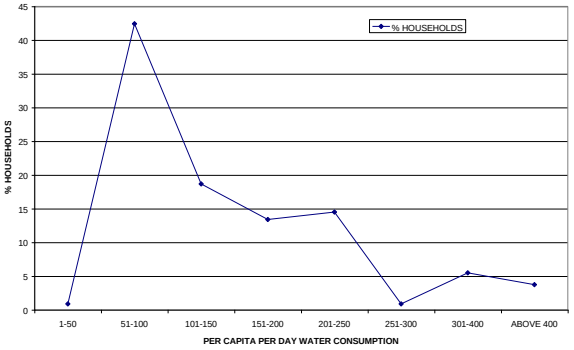
Figure-2 : Per Capita Water Consumption (Combined)



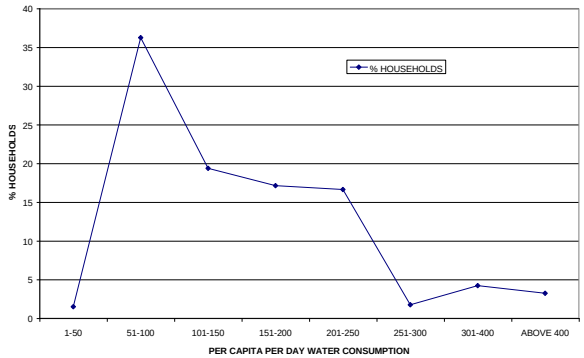
WATER CONSUMPTION(EAST)



WATER CONSUMPTION(WEST)



WATER CONSUMTION(NORTH)



WATER CONSUMPTION(SOUTH)

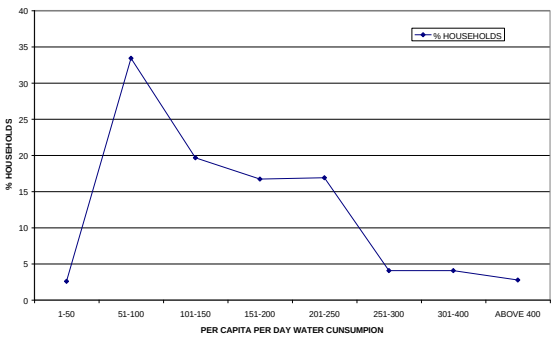
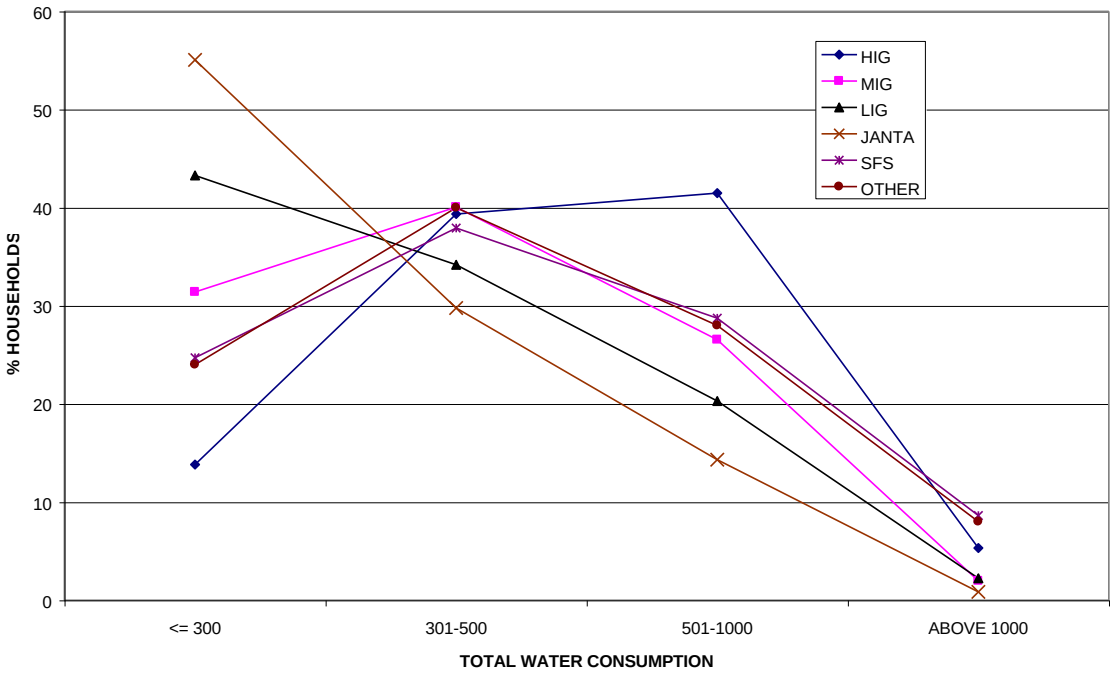
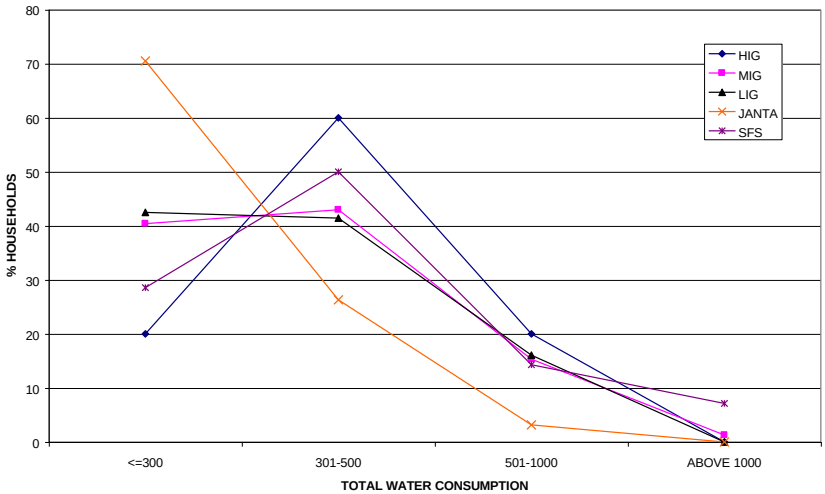


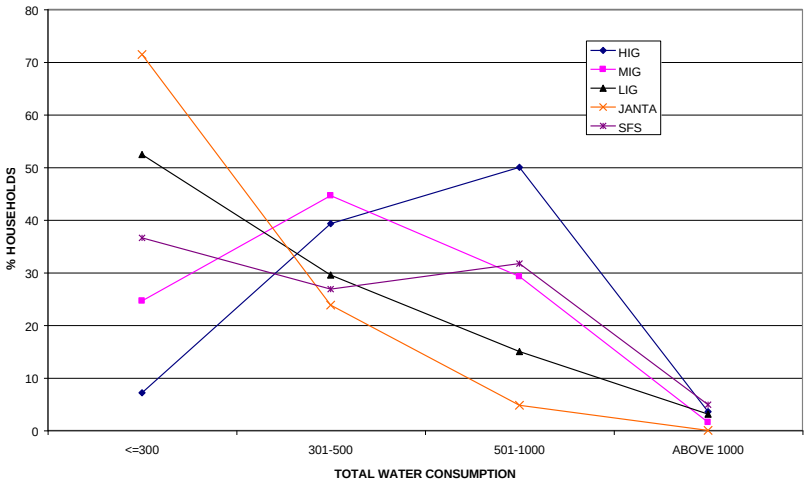
Figure - 3: CONSUMPTION-BY TYPE (COMBINED)



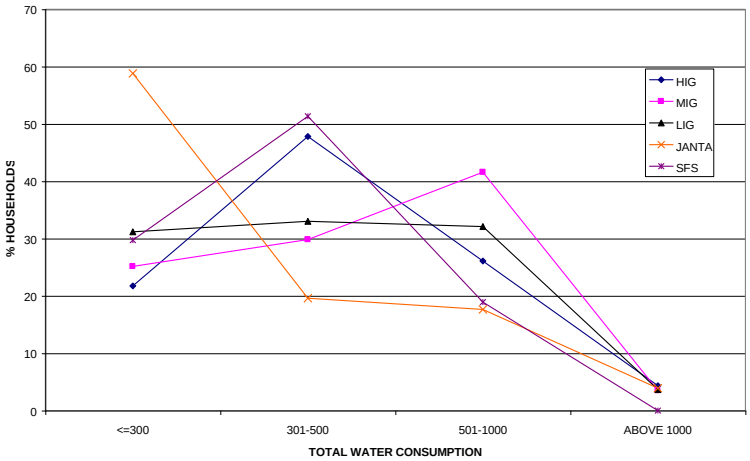
CONSUMPTION-BY TYPE (EAST)



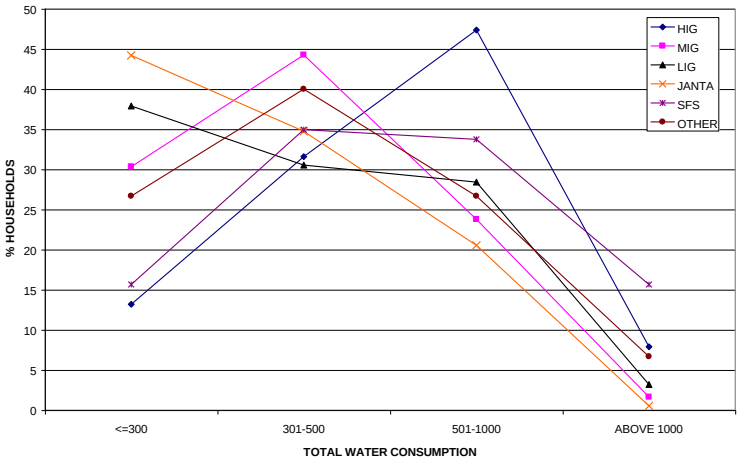
CONSUMPTION-BY TYPE (WEST)



CONSUMPTION-BY TYPE (NORTH)



CONSUMPTION-BY TYPE (SOUTH)



USE DISTRIBUTION

It is clear from the use distribution pattern (Table 2.1) that the relatively major consumption is for washing, for which purpose 87.5% respondents are reporting that they use less than 50 lpcd. For all other uses, including bathing, coolers, gardening, and cooking, the percentage of respondents reporting that they use less than 50 lpcd varies between 92.0-97.5%. The percentage of households using less than 50 lpcd for washing went up significantly to 93% in the East and down to 78% in the West (Tables 2.2 and 2.3), while that for bathing declined somewhat to 86% for the West (Table 2.3). Gardening and cooling uses remained relatively firm around the 95-99% figure for all zones. Hence, it is possible to infer that the main use of domestic water, and therefore wastage, would revolve around washing.

Table 2.1: Percentage of use of water distribution in all zones and catagories.

	Quantity (lpcd)							
	1-50	51-100	101-150	151-200	201-250	251-300	301-400	> 400
Washing	87.5	11.2	0.4	0.6	0.2	0.1	-	-
Bathing	92	6.9	0.7	0.3	-	-	-	-
Coolers	96.7	3	.09	.09	-	-	-	-
Garden	97.5	2	-	-	.5	-	-	-
Cooking	97	2.9	.1	-	-	-	-	-
Others	90	6.6	.7	.4	1	.3	.6	.3

Table 2.2: Percentage of use of water distribution in East zone and all categories.

	Quantity (lpcd)							
	1-50	51-100	101-150	151-200	201-250	251-300	301-400	> 400
Washing	93.3	6.7	-	-	-	-	-	-
Bathing	95.9	3.9	.2	-	-	-	-	-
Coolers	94.7	4.7	-	.6	-	-	-	-
Garden	98.7	1.3	-	-	-	-	-	-
Cooking	97.3	2.5	.2	-	-	-	-	-
Others	97.3	2.5	.2	-	-	-	-	-

Table 2.3: Percentage of use of water distribution in West zone and all categories.

	Quantity (lpcd)							
	1-50	51-100	101-150	151-200	201-250	251-300	301-400	> 400
Washing	78.4	17.8	-	3.8	-	-	-	-
Bathing	75.6	11.3	3.1	-	-	-	-	-
Coolers	97.3	2.3	-	.4	-	-	-	-
Garden	95.9	4.1	-	-	-	-	-	-
Cooking	97.1	2.5	.4	-	-	-	-	-
Others	100	-	-	-	-	-	-	-

CONSUMPTION PATTERNS

Per capita consumption was correlated variously, to Income, Source, number of Bathrooms, number of Toilets, and the Type of flats possessing washing machines. This was done in order to understand who was using more or less water, and what particular feature of the kind of household could possibly explain this behaviour. A few interesting patterns could be observed as follows:

- As seen earlier, higher income levels were correlated with higher per capita consumption. Thus, of poorer families, 63% reported using less than 100 lpcd; in the middle income groups, 65% consumed less than 150 lpcd; and in the rich, the percentage using less than 150 lpcd dropped to 58% (Fig.4.1). These percentages were much higher for the East (69%, 78%, and 73% respectively), and lower for the South (51%, 61%, and 50% respectively), underlining the quality of life differentials between zones (Figs.4.1-E and 4.1-S).

Figure 4.1: CONSUMPTION BY INCOME (COMBINED)

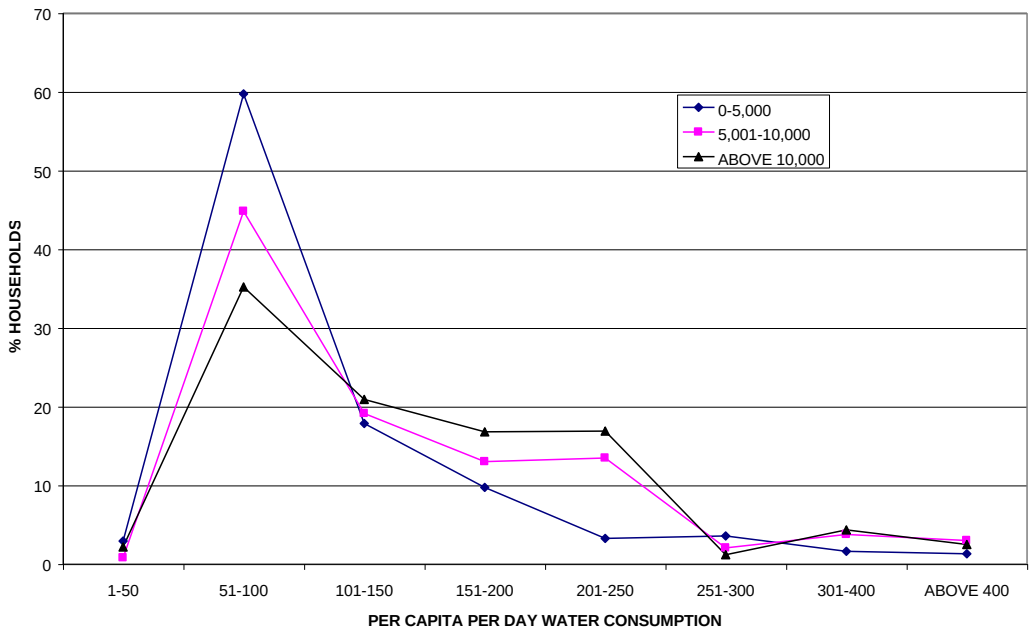


Fig. 4.1-E: Consumption by Income (East)

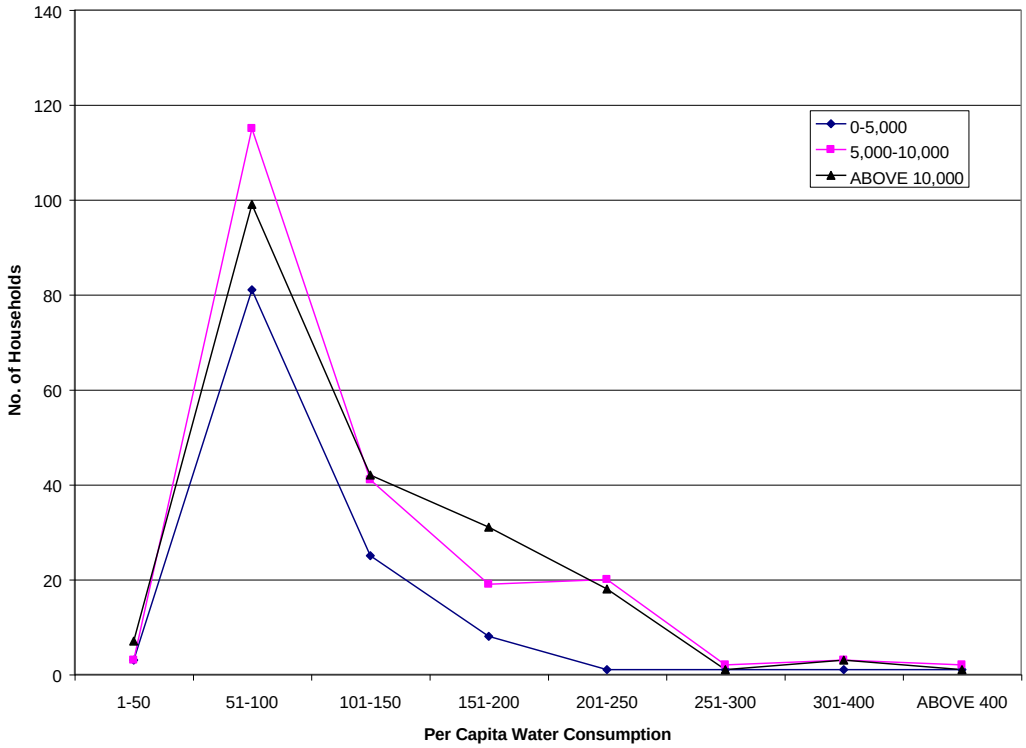
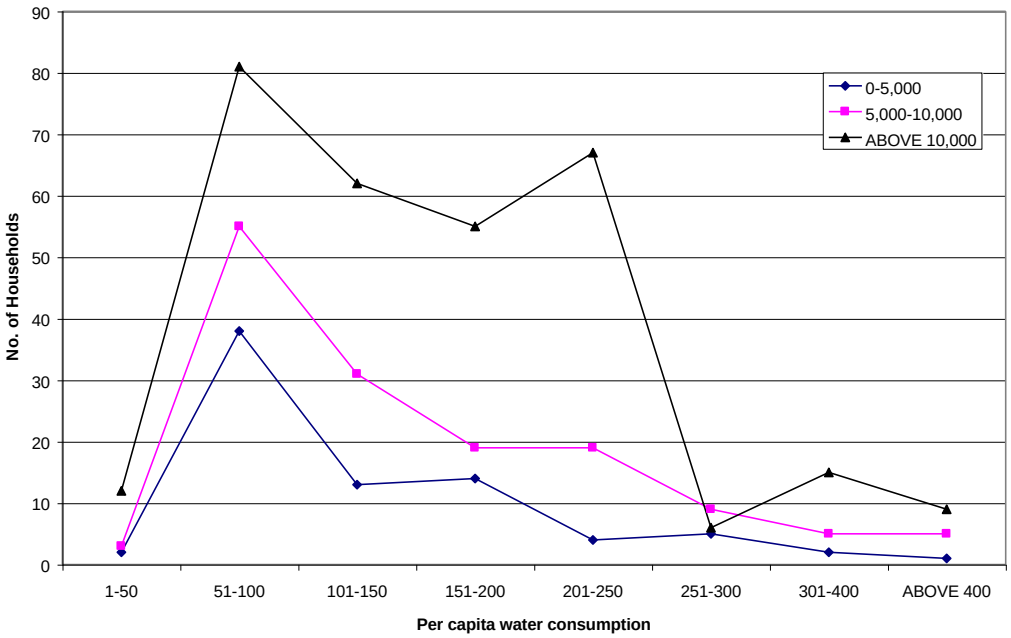


Figure 4.1-S: Consumption by Income (South)



- It was evident that the two main sources for water in the DDA colonies were Taps (61.8%) and Taps with Motors (34.7%). However, while 68% of the former reported using less than 150 lpcd, the percentage dropped to 58% for the latter. In other words, those who had installed motors were clearly using more water per capita than those who were directly drawing water from taps (Fig.4.2). Once again, the East showed a marked variation, with much more dependence on taps (78.9%) than on motors (19.4%), with 77% of the former using less than 150 lpcd as compared to 86% for the latter (Fig.4.2-E).

Figure 4.2: CONSUMPTION BY SOURCE (COMBINED)

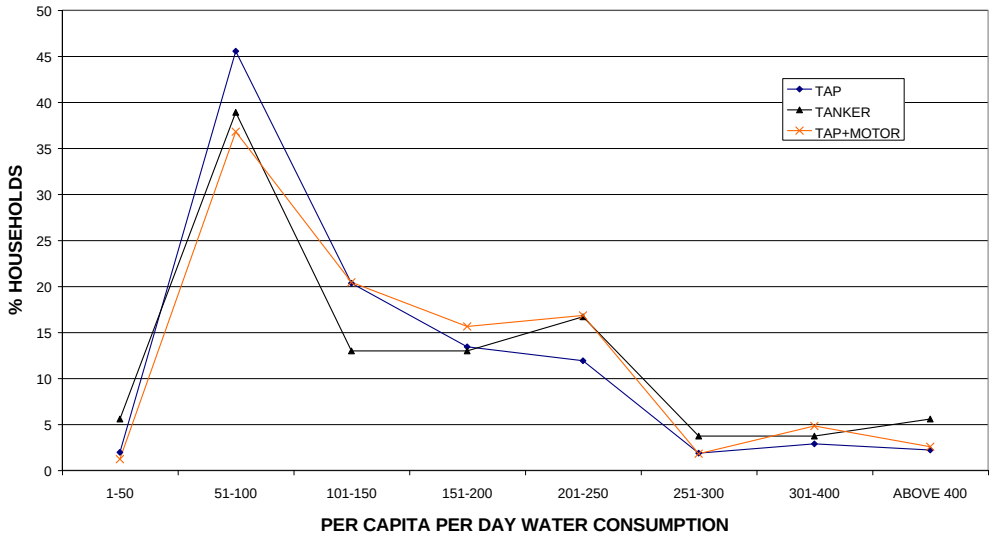
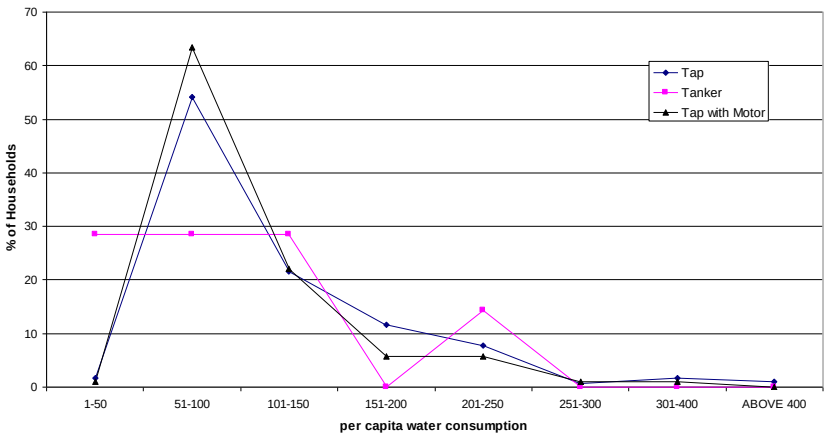


Figure 4.2-E: Consumption by Source (East)



- One or two bathrooms seemed to be the norm in most zones, except in the South where there were a number of households with three bathrooms. The number of bathrooms was also affecting the per capita consumption with 70% of one-bath owners reporting consumption up to 150 lpcd, and 67% of two-bath owners going up to 200 lpcd (fig.4.3). The East was the only exception with figures of 80% and 86% respectively (Fig.4.3-E).

Figure 4.3: CONSUMPTION DISTRIBUTION(COMBINED)-NO. OF BATHROOMS

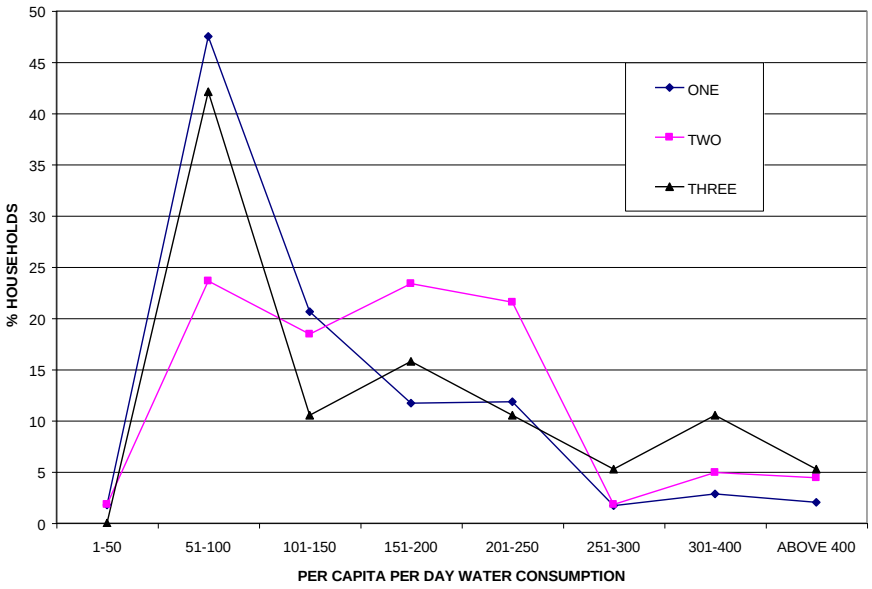
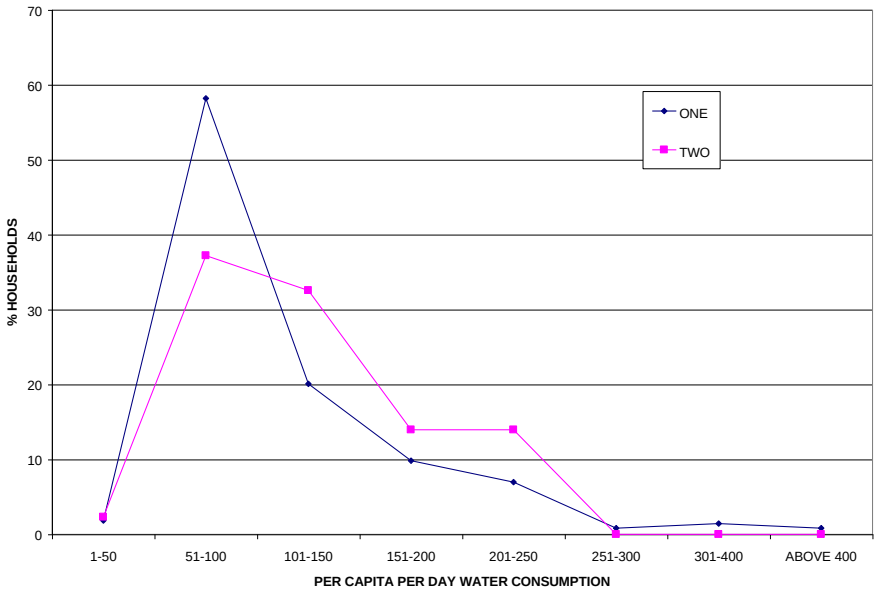


Figure 4.3-E: CONSUMPTION DISTRIBUTION(EAST)-NO. OF BATHROOMS



- Similar patterns were visible for the number of toilets. 70% of one-toilet owners had water consumption less than 150 lpcd, and 64% of two-toilet owners went up to 200 lpcd (Fig.4.4). While, as usual, the East was different with 81% and 78% respectively (Fig.4.4-E).

Figure 4.4 : CONSUMPTION DISTRIBUTION(COMBINED)-NO. OF TOILETS

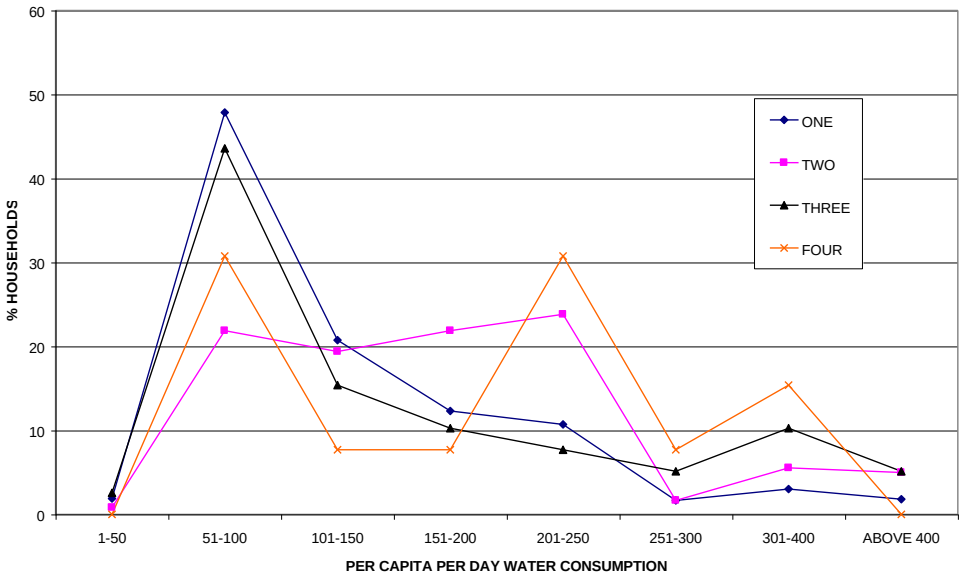
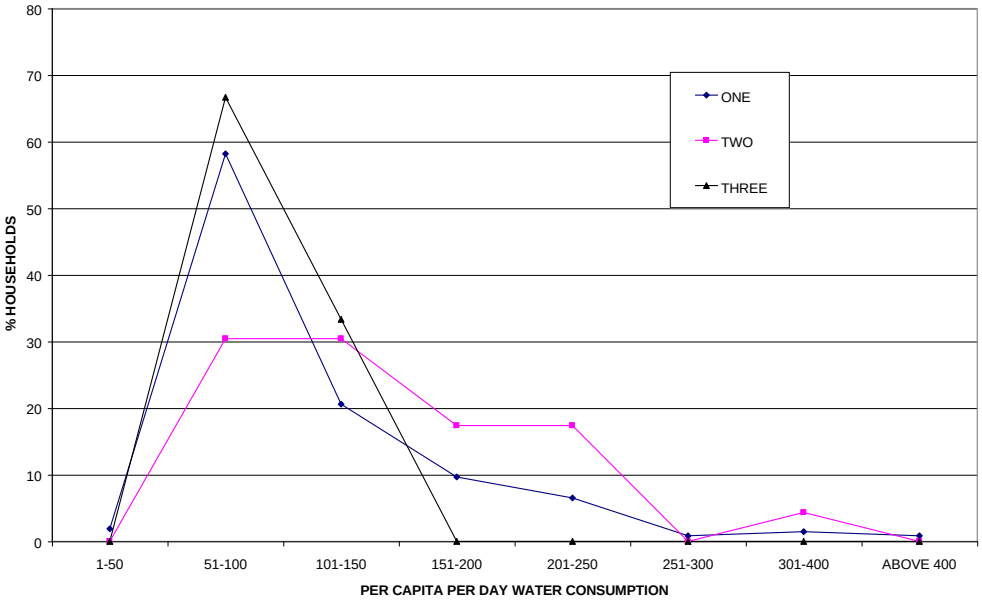
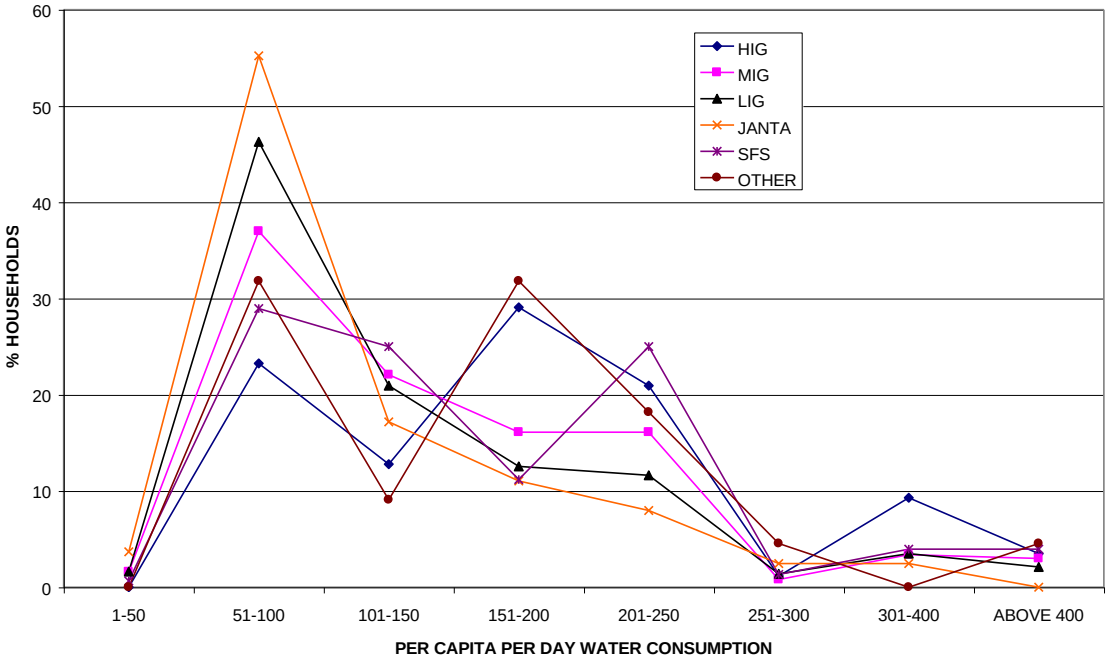


Figure 4.4-E : CONSUMPTION DISTRIBUTION(EAST)-NO. OF TOILETS



- There was some variation in use by different types of flats with washing machines (Fig.4.5), which were 59% of the total respondents. Use of washing machines was heavily biased in favour of the HIG (91%) and SFS (87%) flats. Use was progressively lower in the lower income groups of MIG (76%), LIG (69%), and Janata (46%) households. That may explain why 76% of Janata households with washing machines reported using less

Figure 4.5: WASHING MACHINE CONSUMPTION (COMBINED)



than 150 lpcd totally, while the same use prevailed for 69% of LIG and 60% of MIG flats. 65% of HIG flats and 66% of SFS flats were consuming less than 200 lpcd. There was great variation amongst zones for these figures with East reporting the lowest consumption (Fig.4.5-E) and South the highest (Fig.4.5-S). However, when compared with average per capita consumption figures for all respondents (Figs.2 and 4.1), it does not appear as if washing machines significantly alter consumption patterns.

Figure 4.5-E: WASHING MACHIE CONSUMPTON-BY TYPE (EAST)

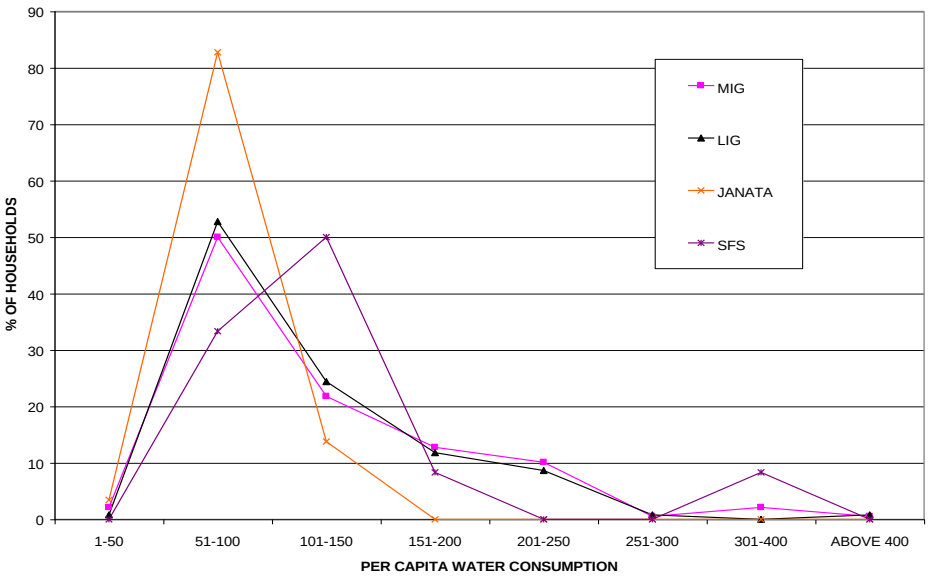
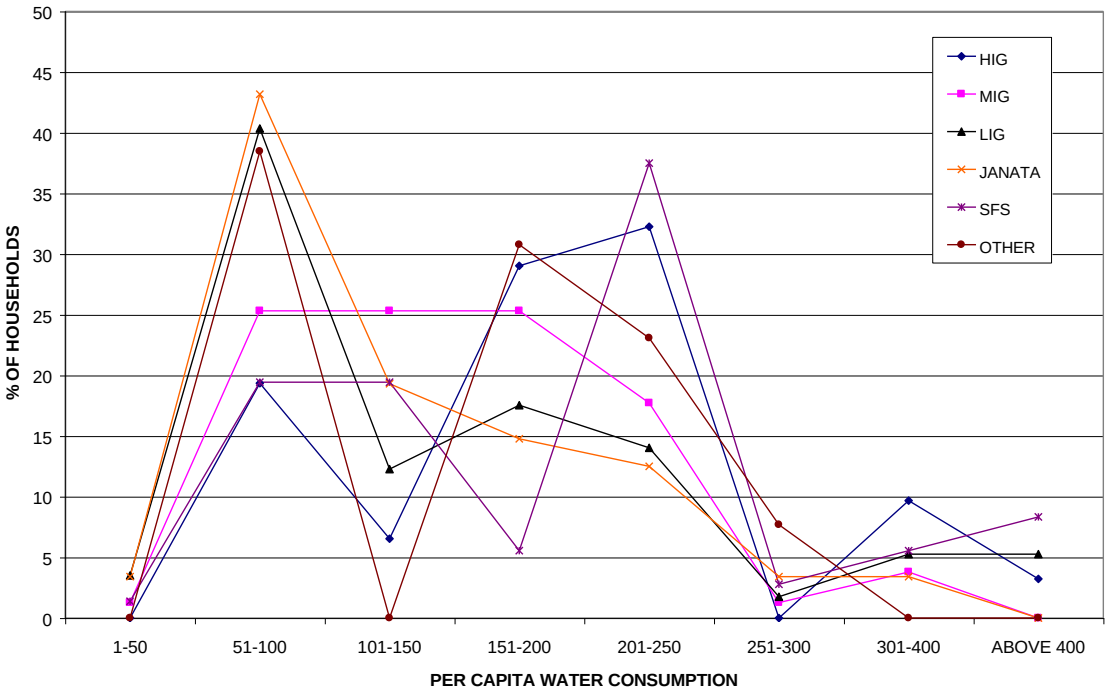


Figure 4.5-S: WASHING MACHINE CONSUMPTION- BY TYPE (SOUTH)



REQUIREMENTS

Respondents were asked to compute the amount of water they thought they required, and per capita requirement was plotted against Type, Floor, and Income. The following patterns could be interpreted:

- 73% of Janata households report that they require less than 100 lpcd, while 74% of LIG owners say they need less than 150 lpcd (Fig.5.1). As the type levels go up, so does requirement. Thus, 67% of MIG respondents need less than 150 lpcd, while 67% of HIG and 66% of SFS households report a higher requirement of 200 lpcd. As is to be expected, the East zone families say they require less (Fig.5.1-E) and the South requires more (Fig.5.1-S), and curiously, the higher category (HIG and SFS) groups in the West also say they need less (Fig.5.1-W).

Figure 5.1: WATER REQUIRED(COMBINED)-TYPE

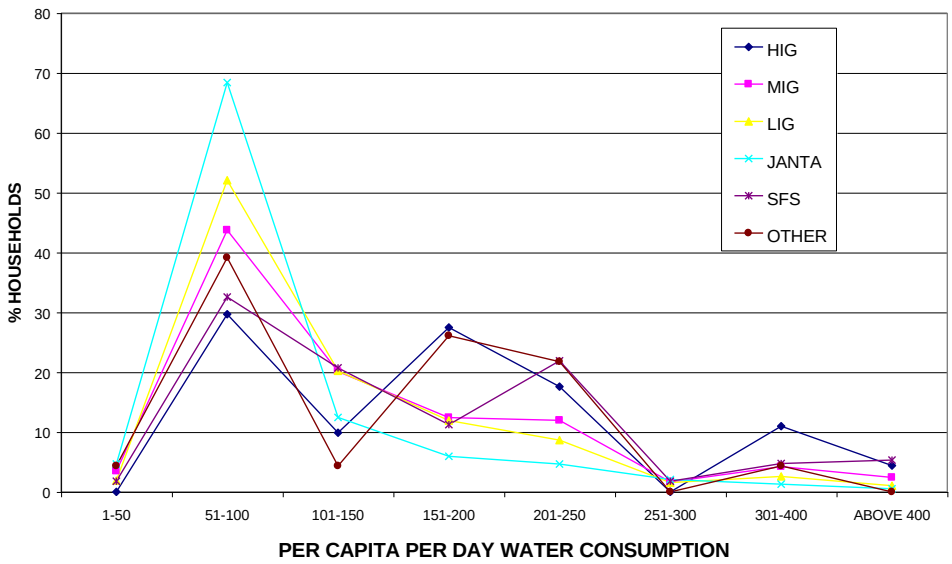


Figure 5.1-E : WATER REQUIRED-TYPE (EAST)

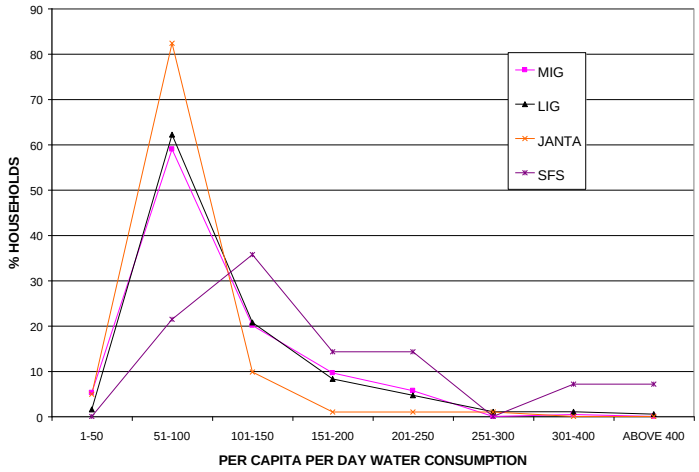


Figure 5.1-S: WATER REQUIRED-TYPE (SOUTH)

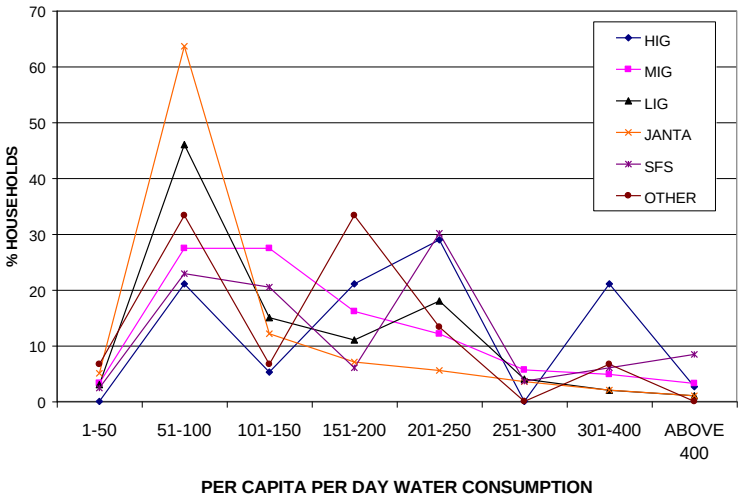
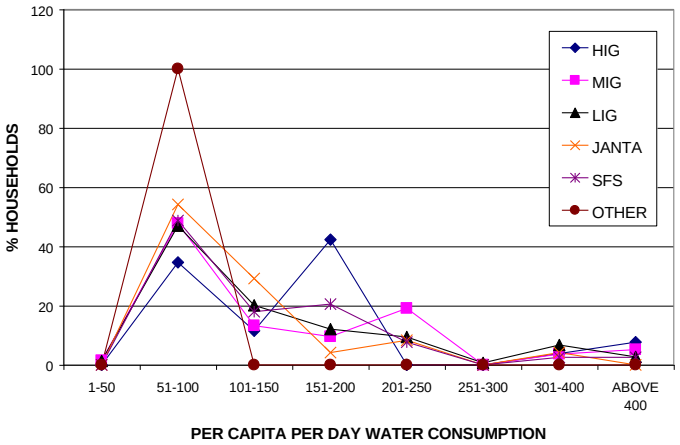


Figure 5.1-W : WATER REQUIRED- TYPE (WEST)



- The kind of floor on which respondents are located does not seem to make much of a difference in requirement (Fig.5.2). 72% of ground floor respondents, 70% on the first floor, 69% on the second floor, and 72% on the third floor, say they need less than 150 lpcd. Predictably, the percentages go up into the 80s for the East (Fig.5.2-E), and down into the 60s for the South with as few as 49% on the second floor requiring less than 150 lpcd (Fig.5.2-S).

Figure 5.2 : WATER REQUIRED(COMBINED)-FLOOR

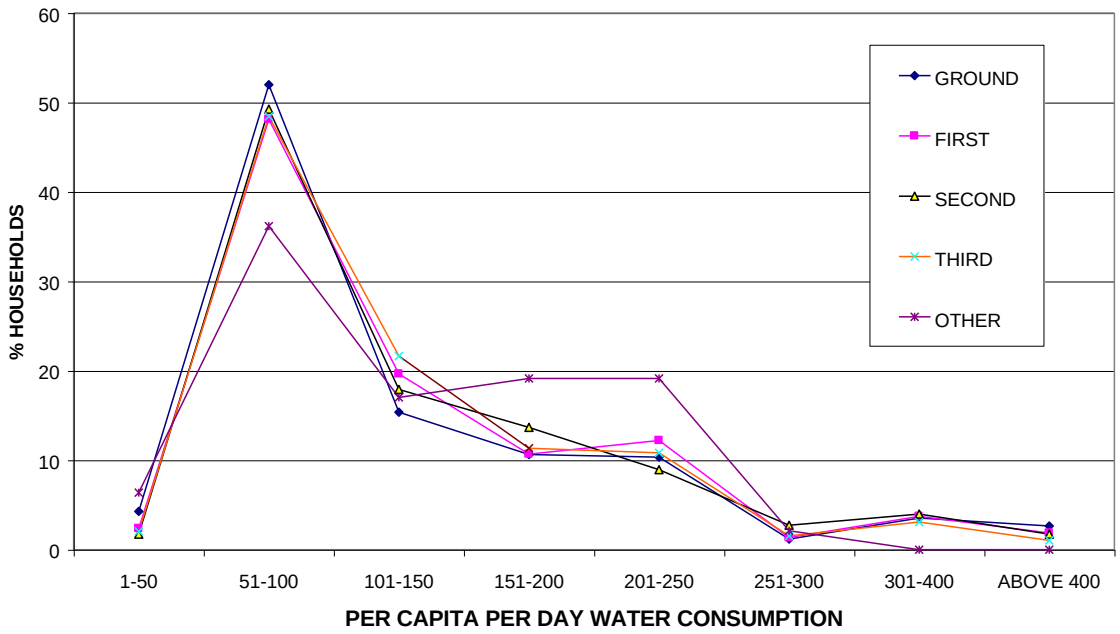


Figure 5.2(E) : WATER REQUIRED(EAST)-FLOOR

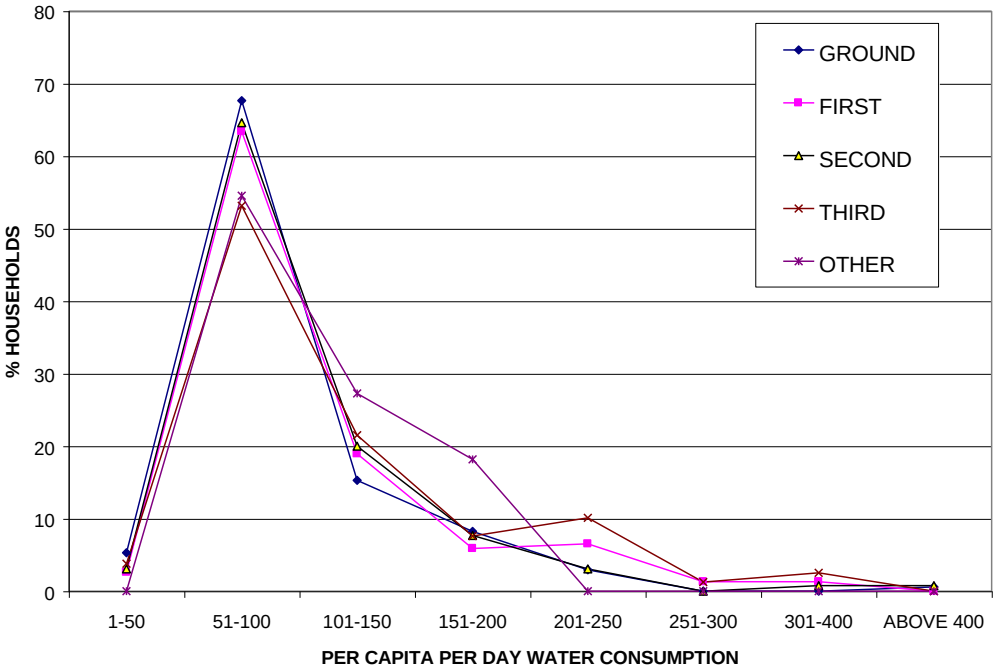
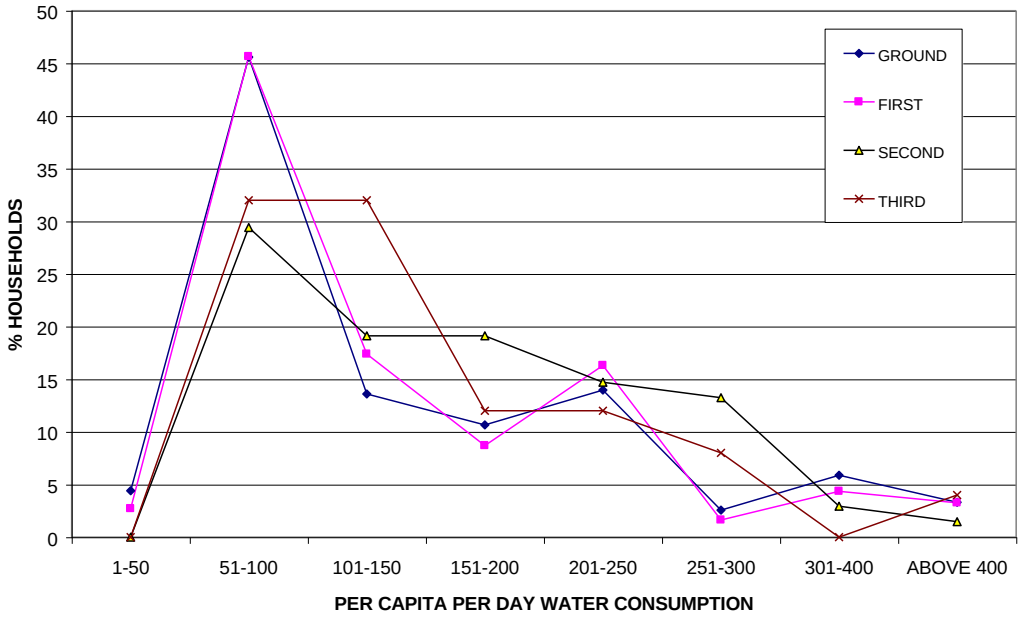
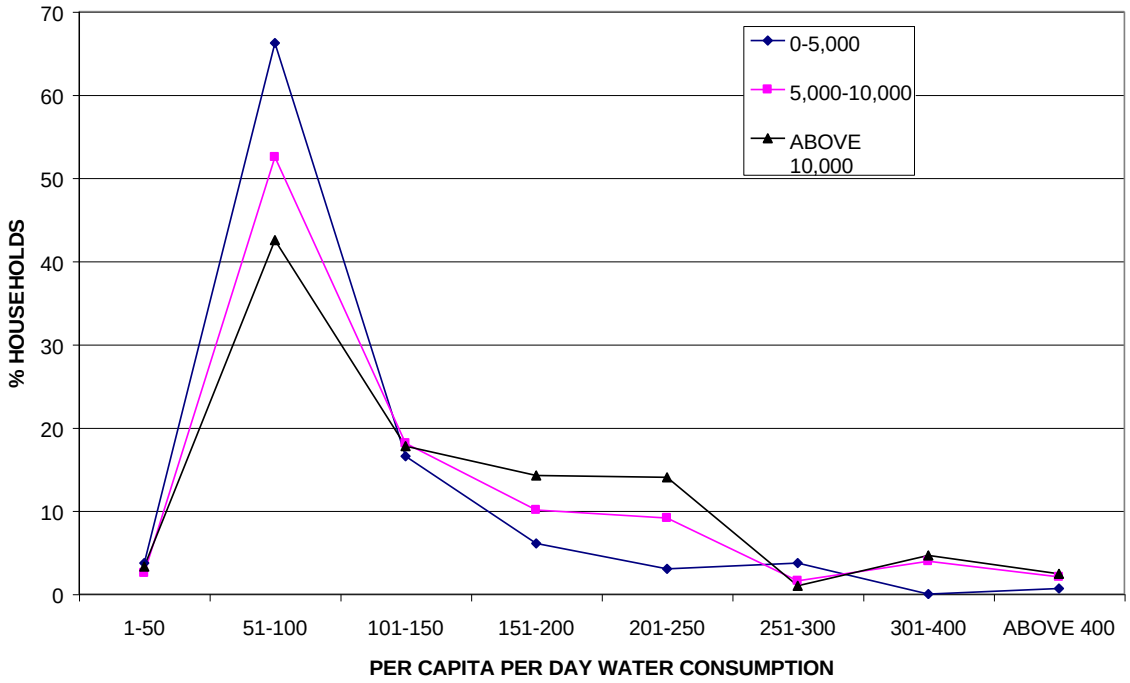


Figure 5.2 (S): WATER REQUIRED(SOUTH)-FLOOR



- Income levels show the same pattern as type of flat (Fig.5.3). 70% of poorer families require less than 100 lpcd, 73% of the middle families need less than 150 lpcd, and 78% of the rich need less than 200 lpcd. It is only in the East that the percentages rise to 76%, 84%, and 94% respectively. In all other zones the percentages are lower.

Figure 5.3 : WATER REQUIRED(COMBINED)-INCOME



STORAGE

Respondents were also storing water in consonance with their requirements. The per capita stored water was plotted against Type, Floor, and Income with the following results:

- 70-80% of all Janata, LIG, and MIG households reported storing less than 150 lpcd, while 71-76% of the higher groups of HIG and SFS stored less than 200 lpcd of water (Fig.6.1). The percentages were higher for the East (Fig.6.1-E) and the North (Fig.6.1-N) and lower for the South (Fig.6.1-S) indicating that there was probably better supply prevailing in the South, although requirements were higher.

Figure 6.1 : WATER SAVED(COMBINED)-TYPE

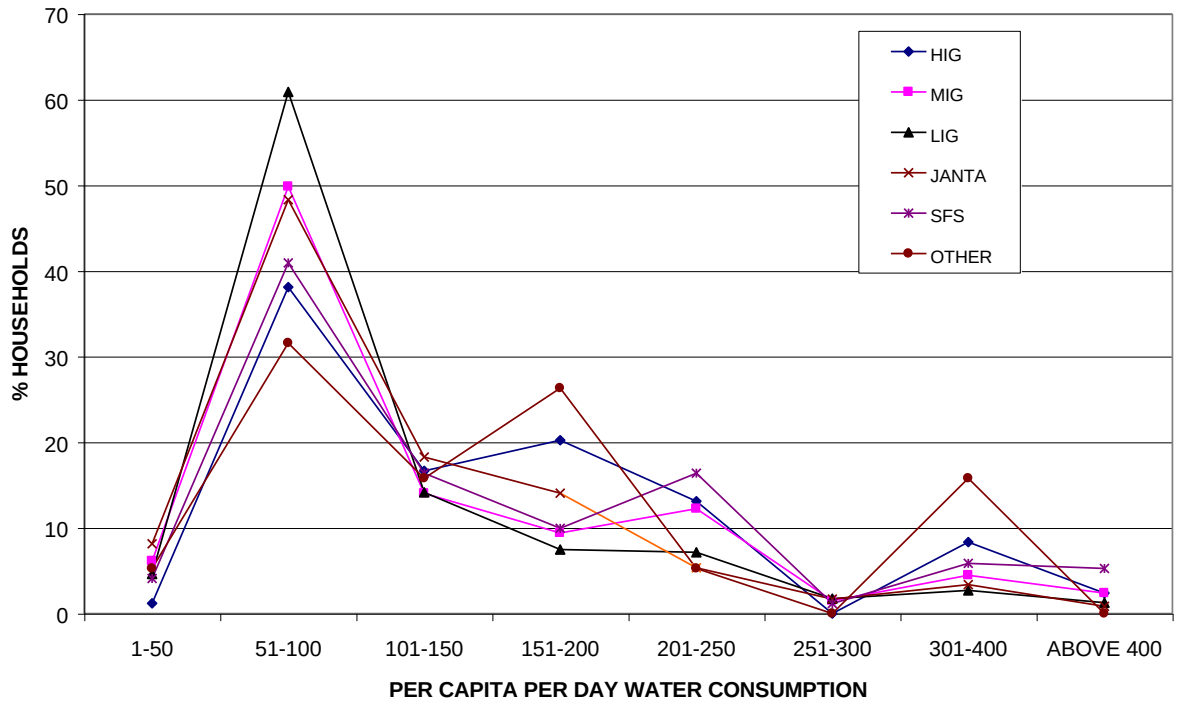


Figure 6.1(E): WATER SAVED(EAST)-TYPE

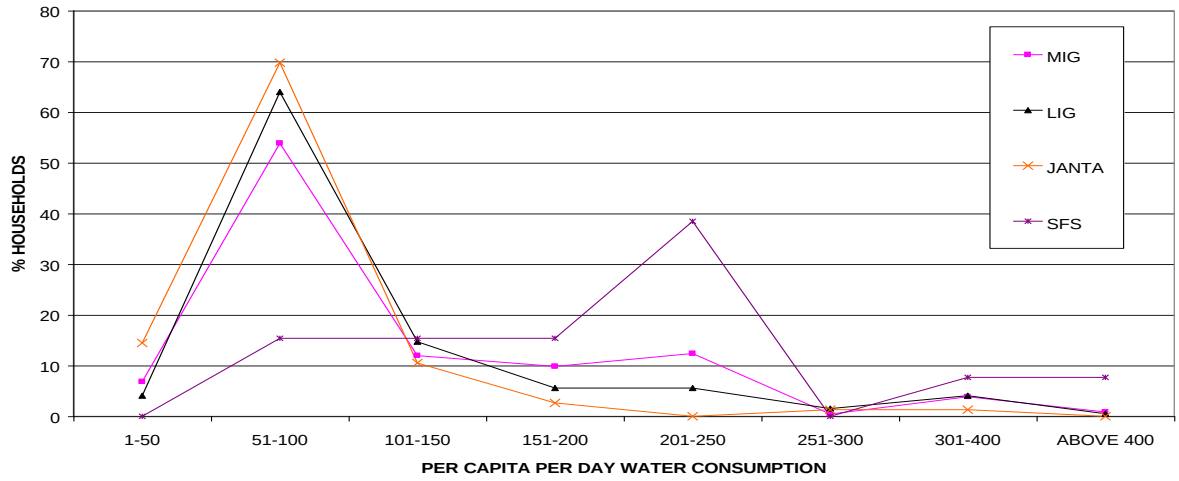


Figure 6.1(N): WATER SAVED(NORTH)-TYPE

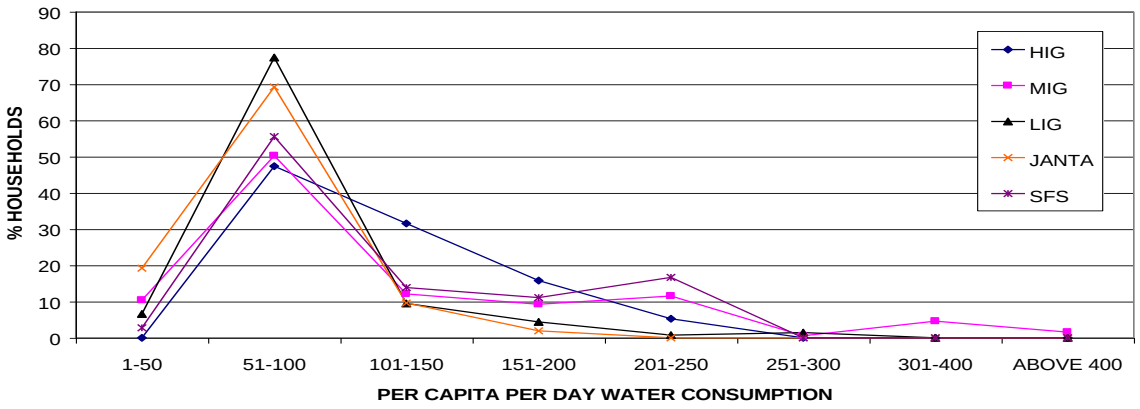
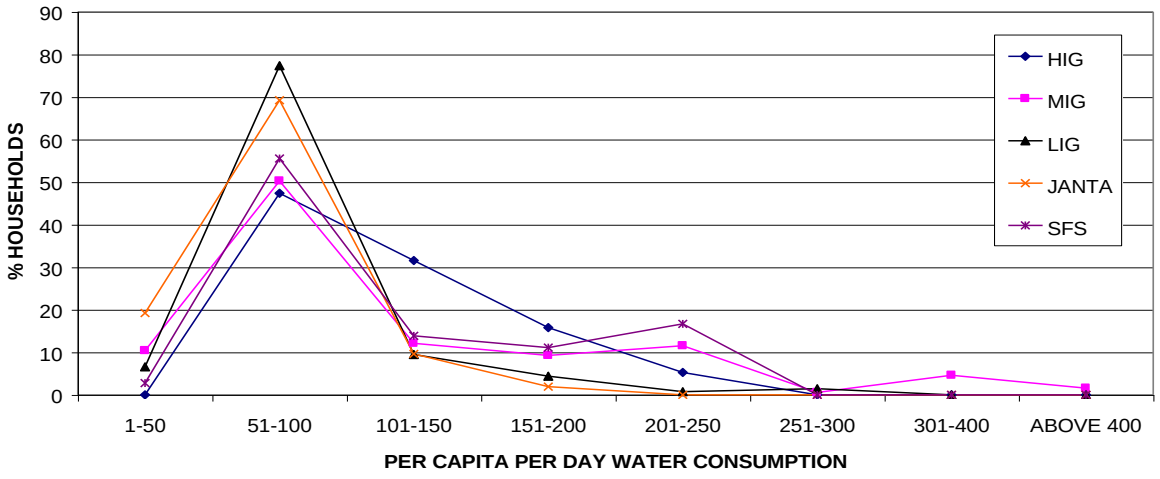


Figure 6.1(N): WATER SAVED(NORTH)-TYPE



- For different floors, there appeared to be a slight variation with 69% of ground floor, 72% of first floor, 75% of second floor, and 78% of third floor residents reporting that they stored less than 150 lpcd (Fig.6.2). Once again the percentages were higher (75-80%) for the East (Fig.6.2-E) and North (Fig.6.2-N) than for the South (51-58%) (Fig.6.2-S).

Figure 6.2 : WATER SAVED(COMBINED)-FLOOR

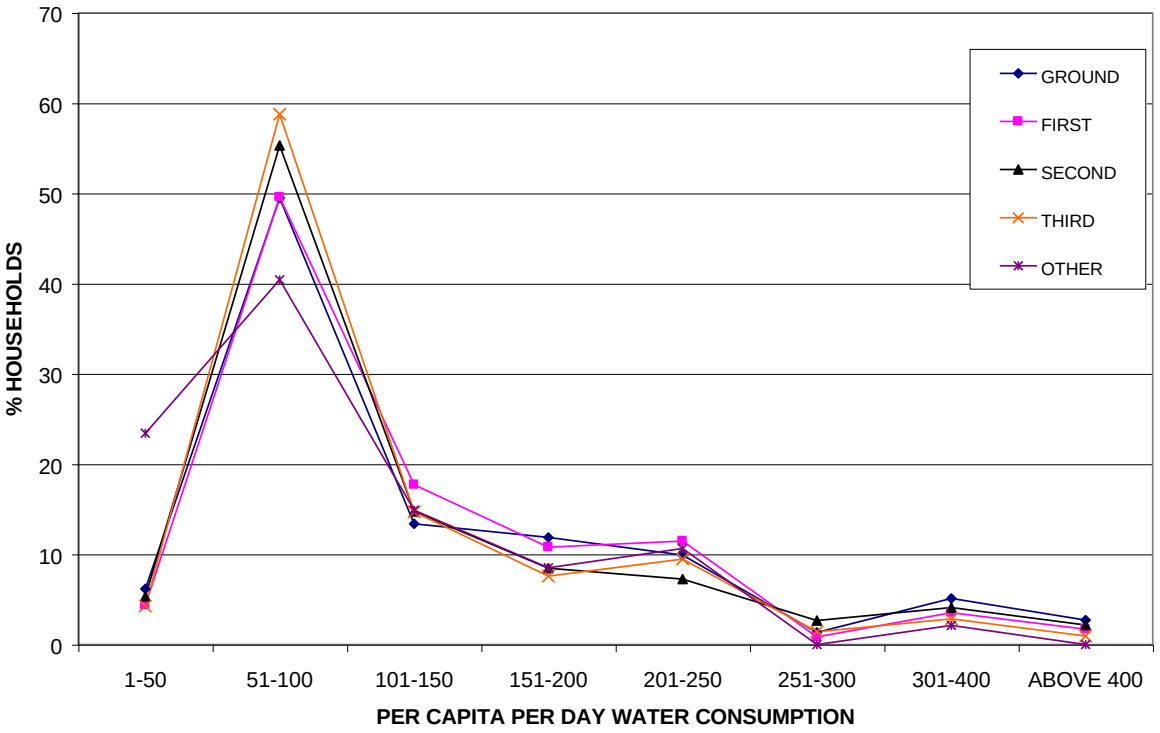


Figure 6.2(E): WATER SAVED(EAST)-FLOOR

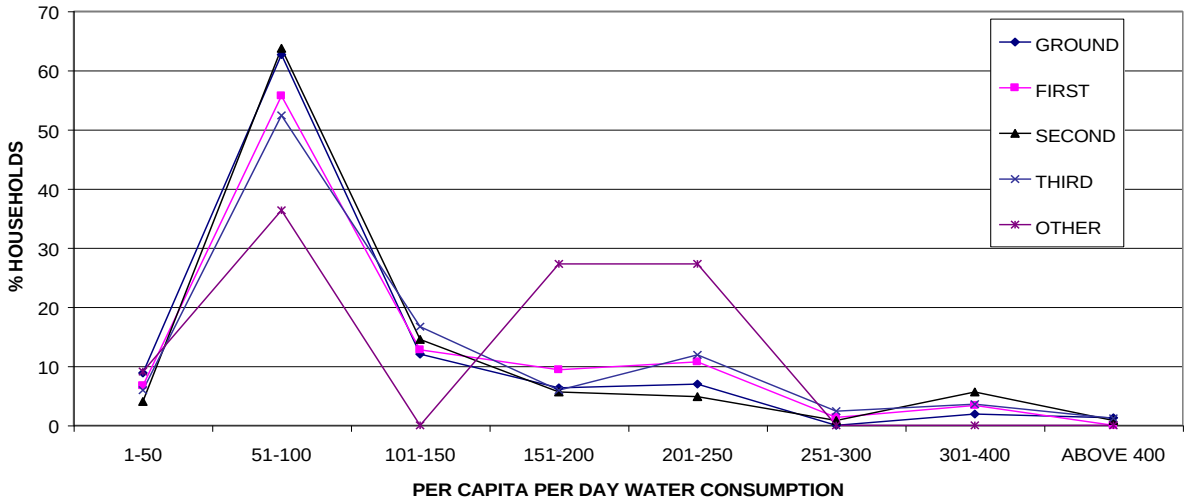


Figure 6.2(N) : WATER SAED(NORTH)-FLOOR

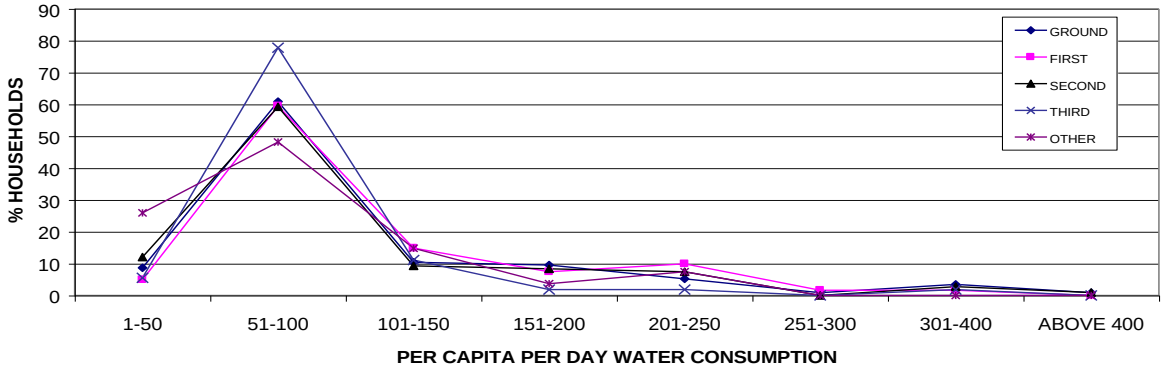
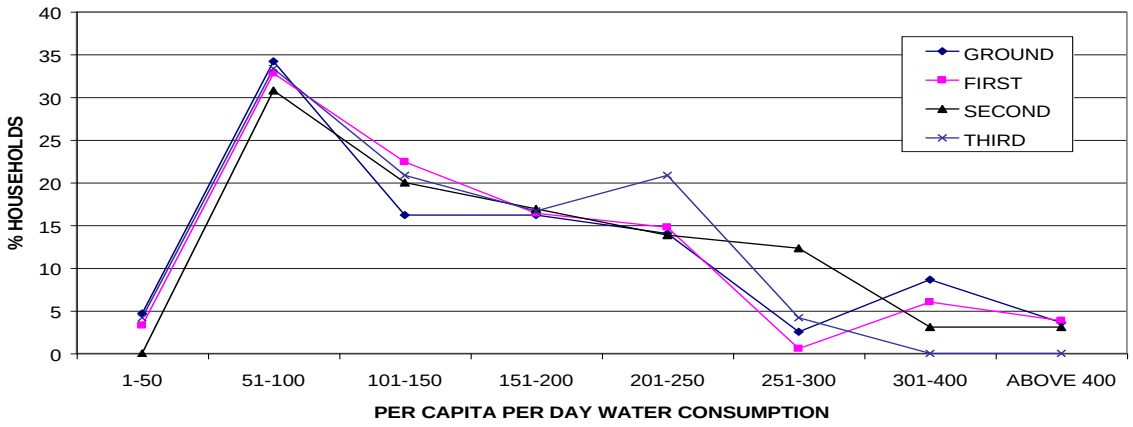


Figure 6.2(S) :WATER SAVED(SOUTH)-FLOOR



- 81% of the poor and 78% of the middle groups said they were storing less than 150 lpcd, while 79% of the rich stored less than 200 lpcd (Fig.6.3). The percentages were higher for all zones other than the South where they fell sharply to 58%, 60%, and 68% respectively (Fig.6.3-S). This supports the earlier observation that requirements were higher in the South.

Figure - 6.3 : WATER SAVED(COMBINED)-INCOME

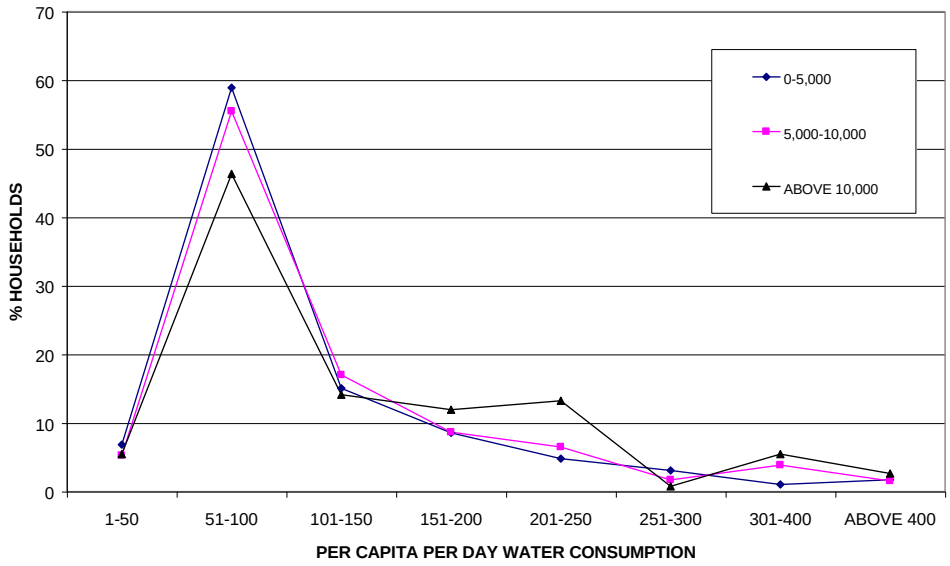
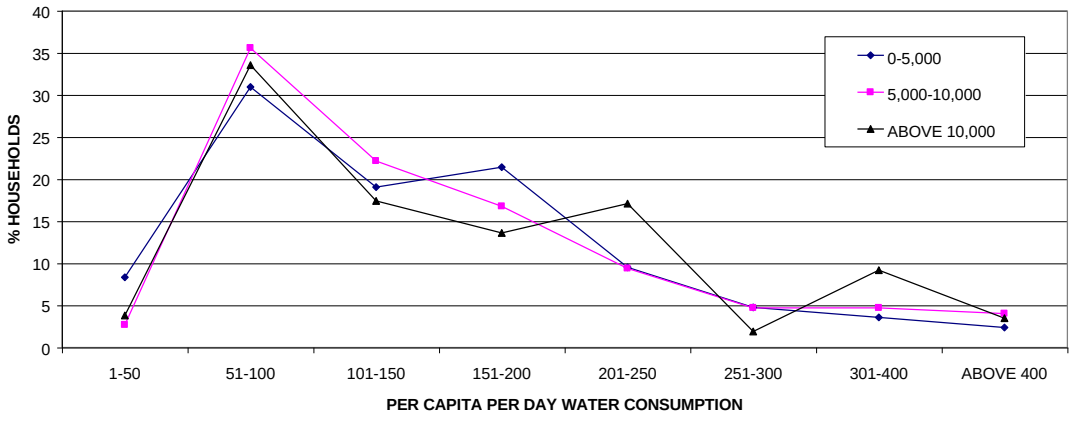


Figure 6.3(S) : WATER SAVED(SOUTH)-INCOME



SATISFACTION

Satisfaction levels (40-42% of respondents) were about the same as dissatisfaction levels (40-41%). Per capita consumption of satisfied households was plotted against Type, Floor, and Income of respondents and the following observations could be made:

- Of the satisfied households, 80% of Janata, 74% of LIG, and 67% of MIG flats said they were consuming less than 150 lpcd, while 70% of HIG and 64%of SFS flats were using less than 200 lpcd (Fig.7.1). Of the dissatisfied households, only 76% of Janata flats were using less than 150 lpcd, but 76% of LIG, 68% of MIG, 66% of HIG, and 66% of SFS were all in the 200 lpcd range (Fig.8.1) Dissatisfaction was also more marked in the South (Fig.8.1-S). Thus, it would appear that the quantity of water is not a major cause for dissatisfaction.

Figure 7.1 : SATISFIED HOUSEHOLDS (BY TYPE) (COMBINED)

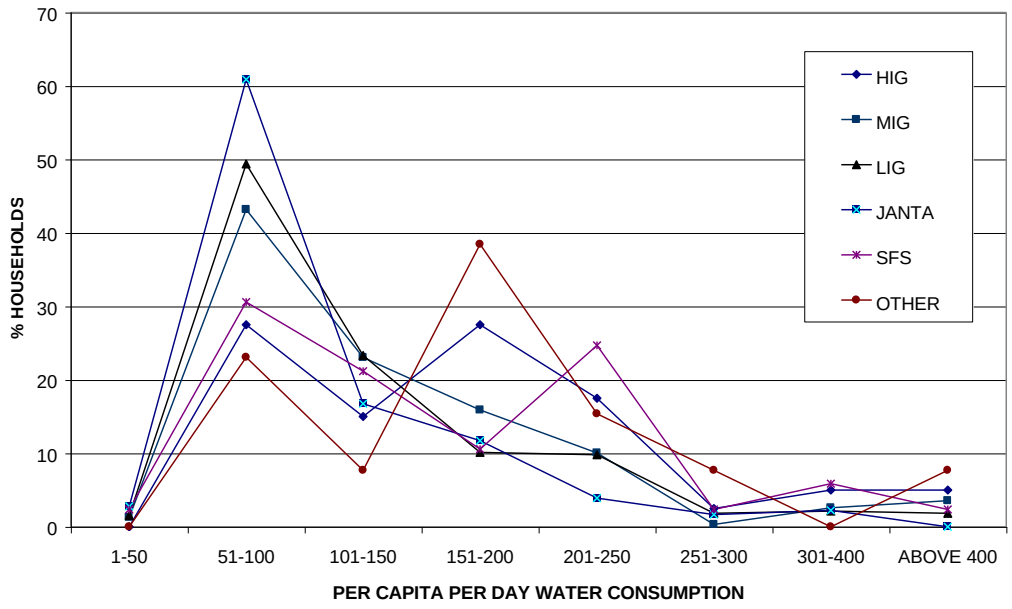


Figure 8.1 : DISSATISFIED HOUSEHOLDS (BY TYPE) (COMBINED)

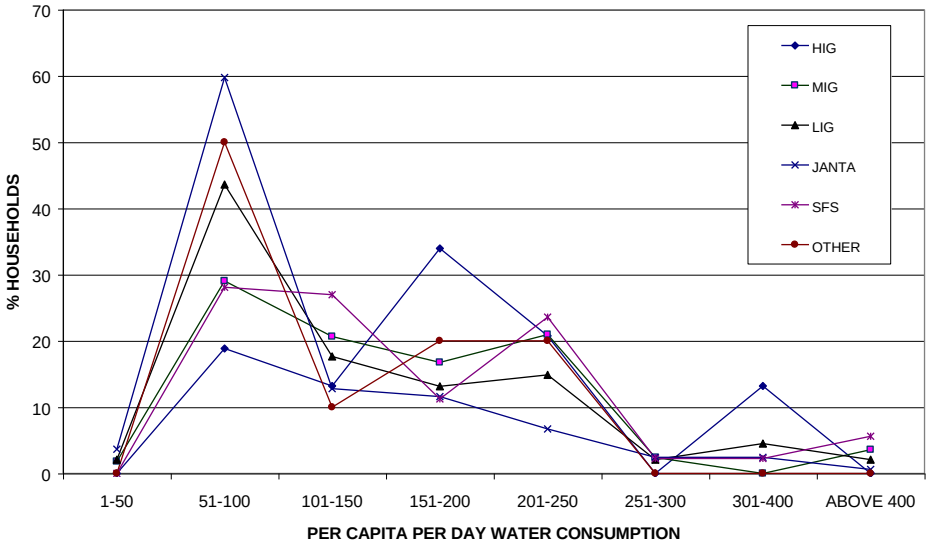
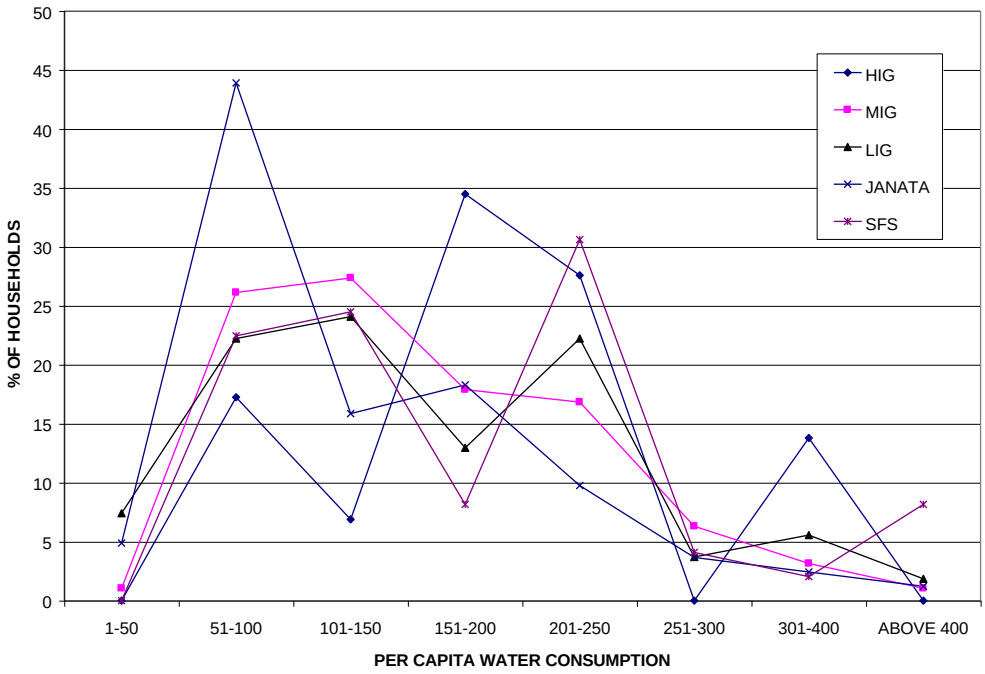


Figure 8.1(S) : DISSATISFIED-BY TYPE (SOUTH)



- There is little variation in satisfaction levels for different floors. 68% of ground floor, 72% of first floor, 69% of second floor, and 70% of third floor residents say they are satisfied with less than 150 lpcd (Fig.7.2). Dissatisfaction is expressed at a higher level of consumption. 76% of the dissatisfied respondents on the ground floor, 72% on the first floor, 75% on the second floor, and 67% on the third floor are all using less than 200 lpcd (Fig.8.2). The variation is marked for the satisfied groups in the case of the South, falling from 60 to 39% with the rise in floors at the 150 lpcd consumption level (Fig.7.2-S), and for the dissatisfied groups in the North, with a sharp fall from 83 to 65% at a consumption level of 200 lpcd. Hence, there may be significant pressure problems in these two areas.

Figure 7.2 : SATISFIED HOUSEHOLDS (BY FLOOR) (COMBINED)

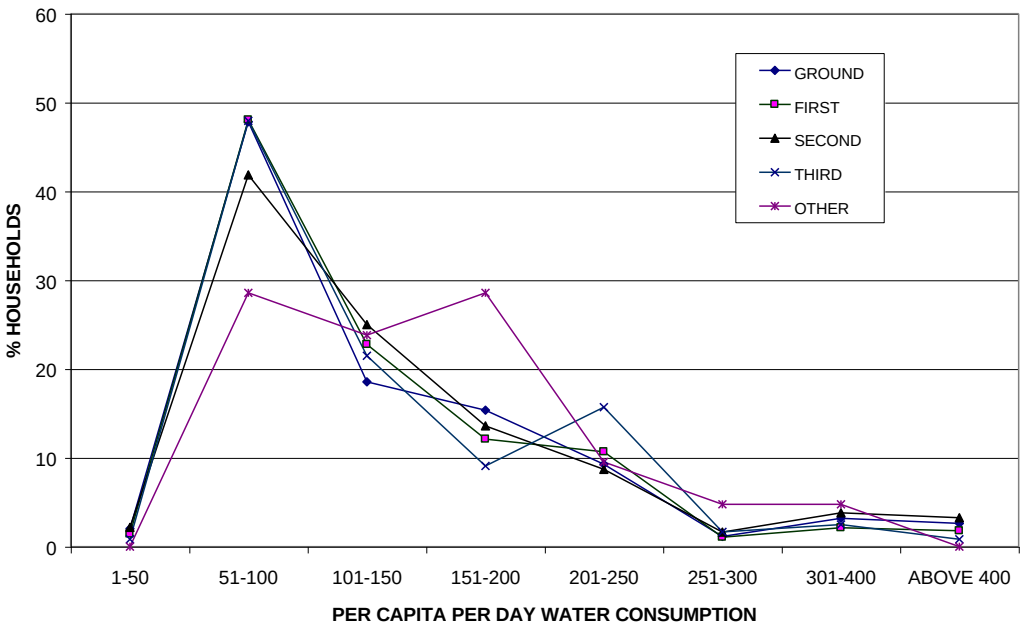


Figure 8.2 : DISSATISFIED HOUSEHOLDS (BY FLOOR) (COMBINED)

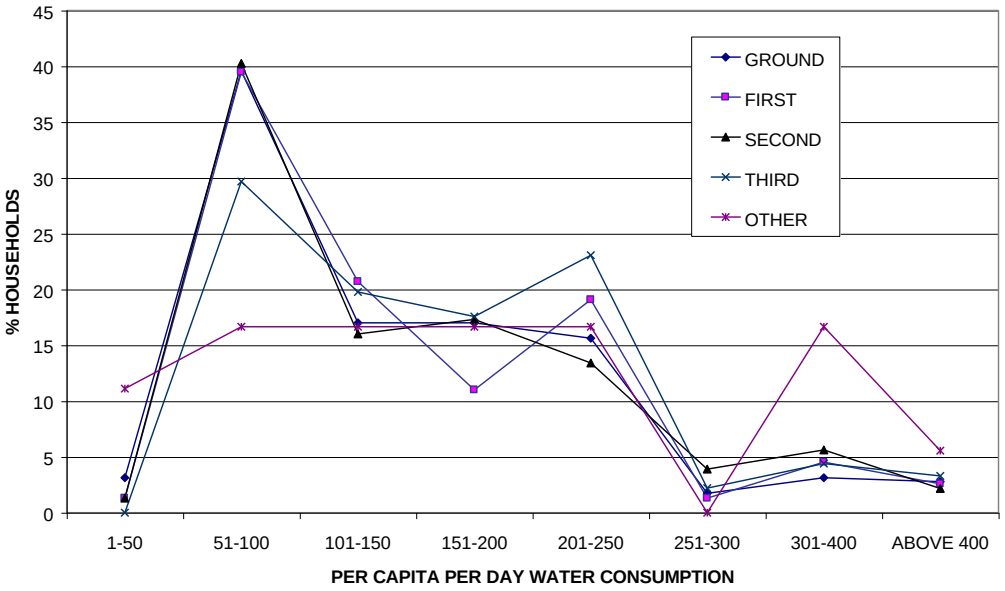
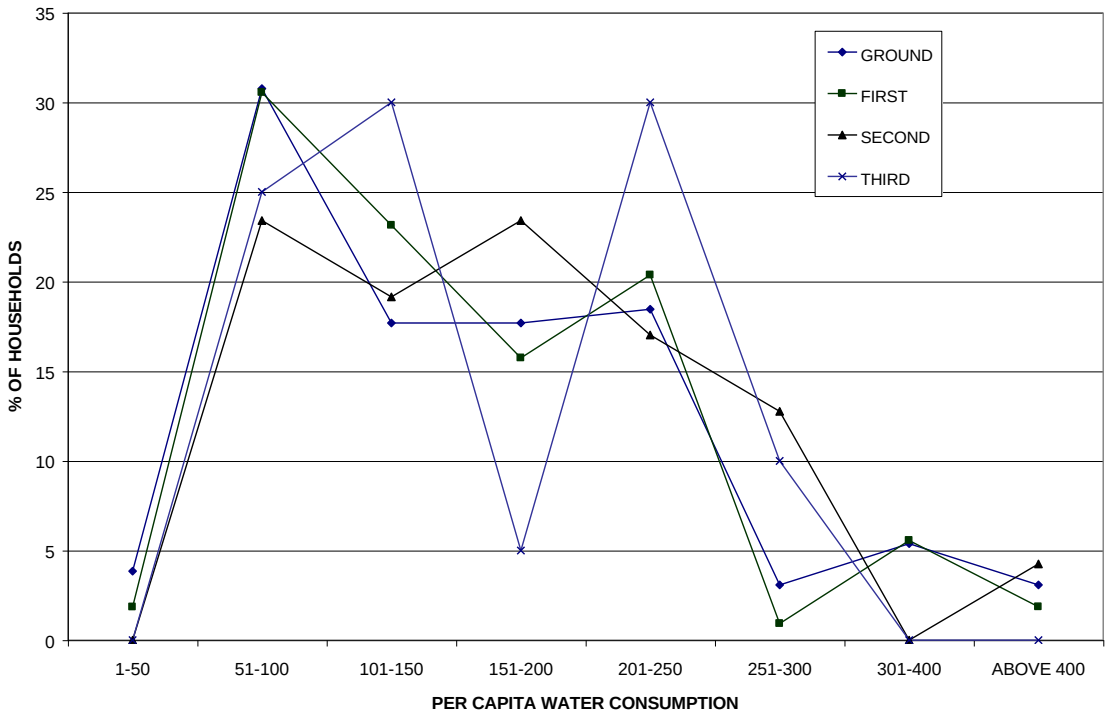
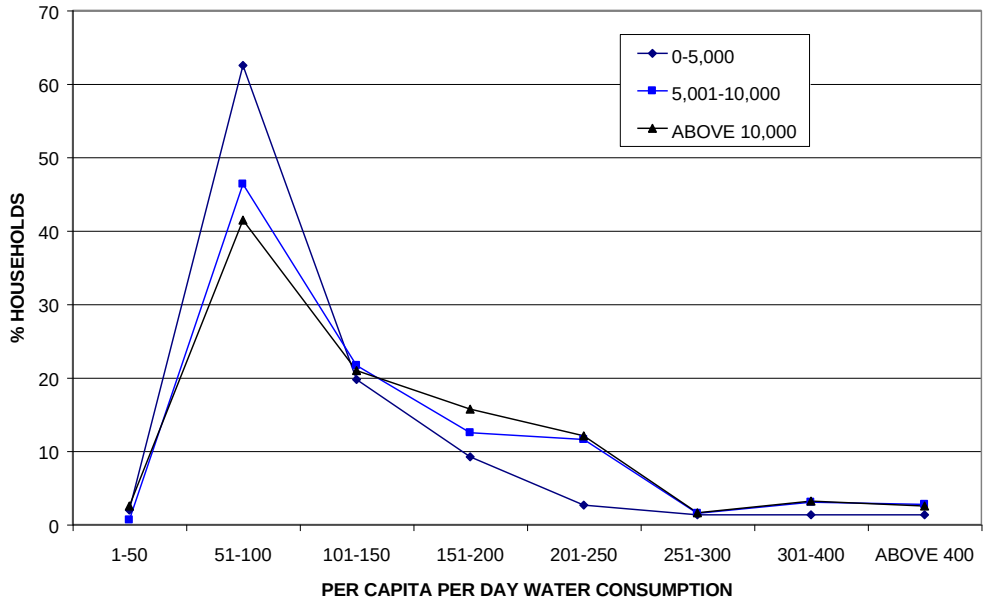


Figure 7.2(S) : DISSATISFIED - BY FLOOR (SOUTH)



- Lower income groups are evidently more satisfied with the supply of less water. Thus, 84% of the satisfied poor are consuming less than 150 lpcd, but the percentage for the middle is 69%, and for the rich 65% (Fig.7.3). In the dissatisfied households, 76% of the poor are consuming less than 150 lpcd, while 74% of the middle and 70% of the rich are consuming less than 200 lpcd. Hence, once again, quantity of water available may not be the biggest problem.

Figure 7.3 : SATISFIED HOUSEHOLDS (BY INCOME) (COMBINED)



REASONS FOR WATER PROBLEMS

Respondents were asked to identify the main problems in water supply systems with respect to quantity, pressure, irregularity, timing, and quality. The following trends were observed in the responses:

- 35-44% of respondents in all types of flats (Fig.9.1), 32-43% on all floors (Fig.9.2), and 37-38% in different income groups (Fig.9.3) identified low pressure of water as the main problem. All other problems got less than 25% response for the total sample.

Figure 9.1 : REASONS FOR WATER PROBLEM-BY TYPE (COMBINED)

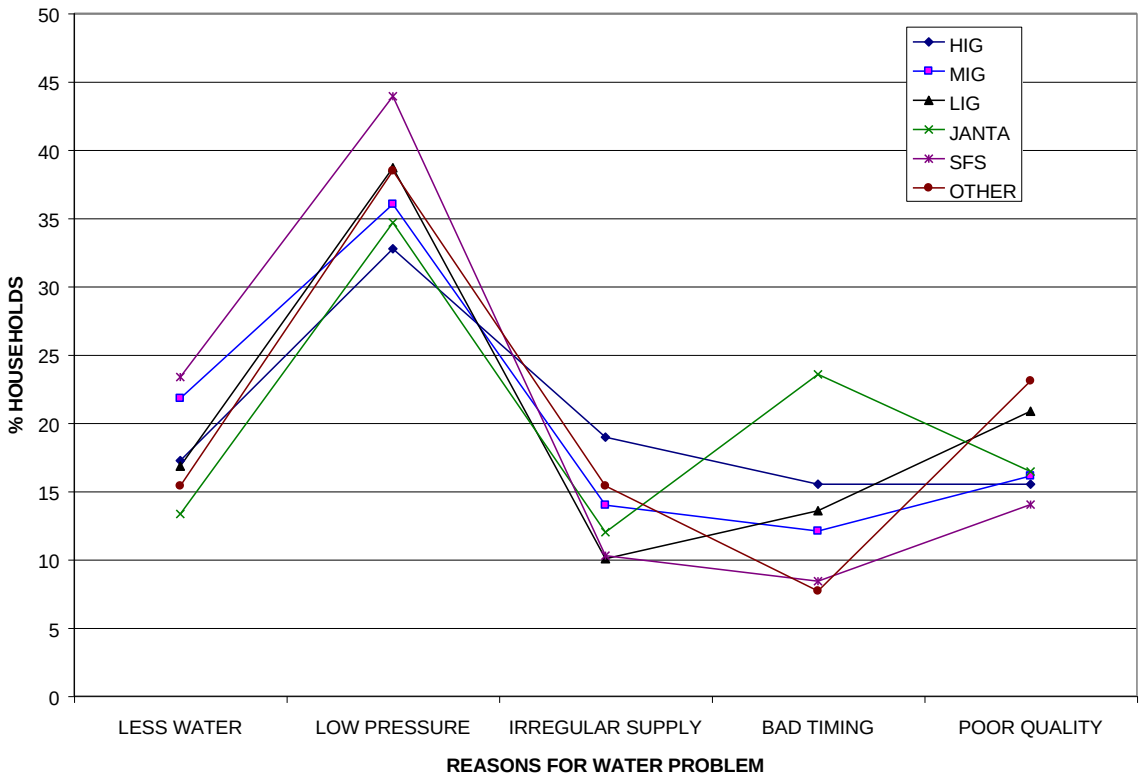


Figure 9.2 : REASONS FOR WATER PROBLEM-BY FLOOR (COMBINED)

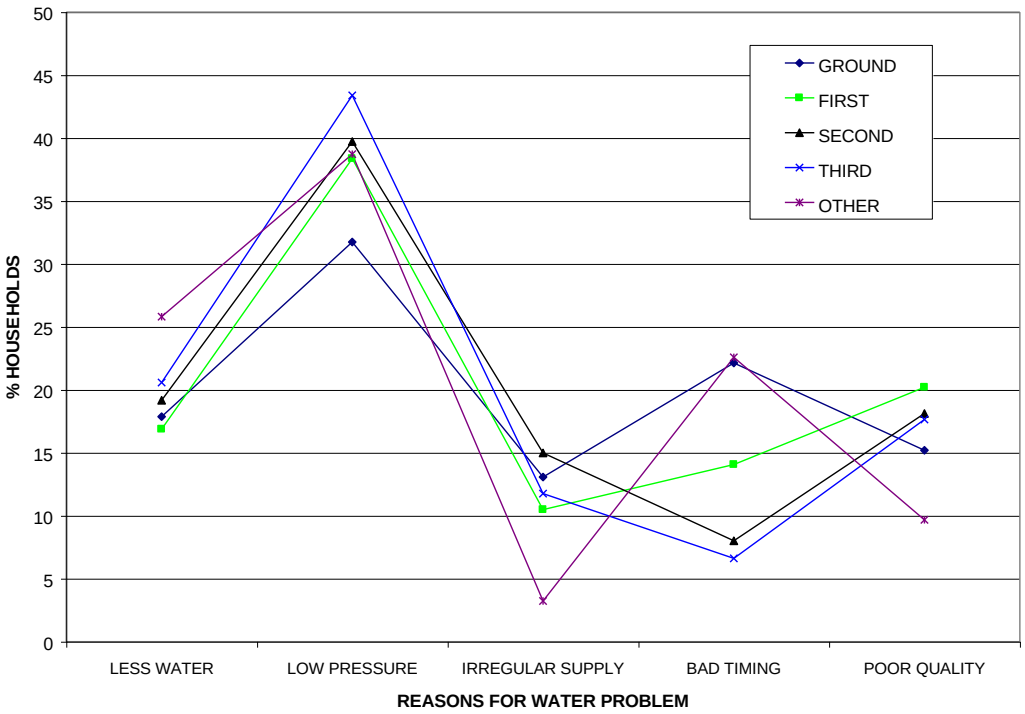
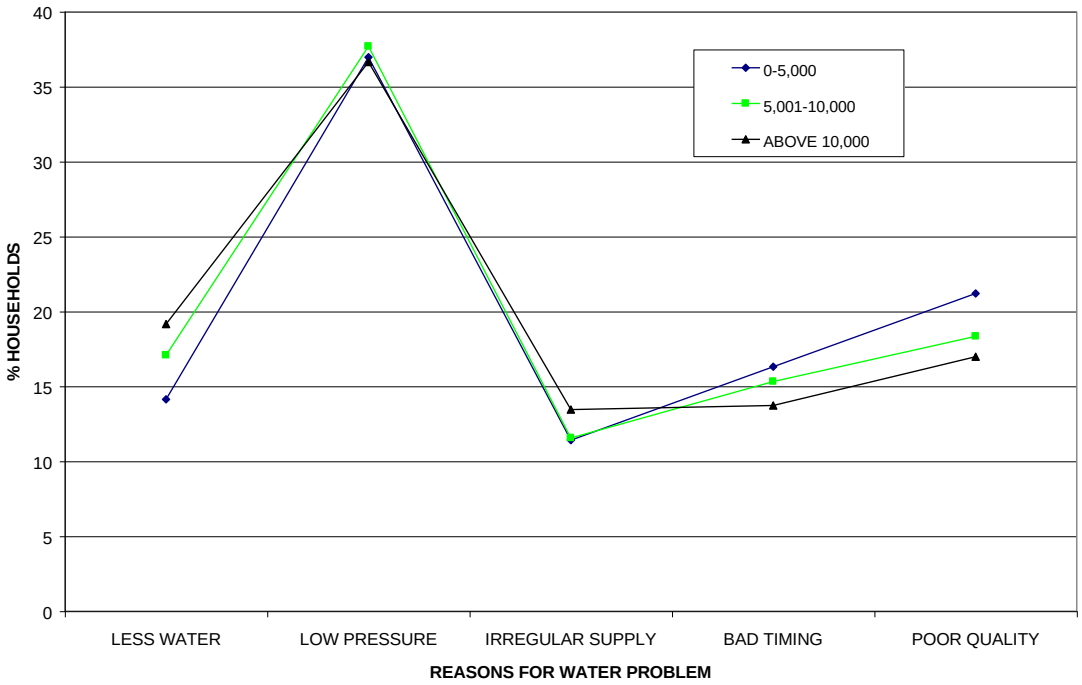


Figure 9.3 : REASONS FOR WATER PROBLEM-BY INCOME (COMBINED)



- In the East zone, other than low pressure, irregular supply was a problem identified by 36% of SFS flats, while poor quality of water was significant for 29% of Janata flats, 26% of LIG flats (Fig.9.1-E), and 30% of the poor (Fig.9.3-E).

Figure 9.1(E) : REASONS FOR WATER PROBLEM-BY TYPE (EAST)

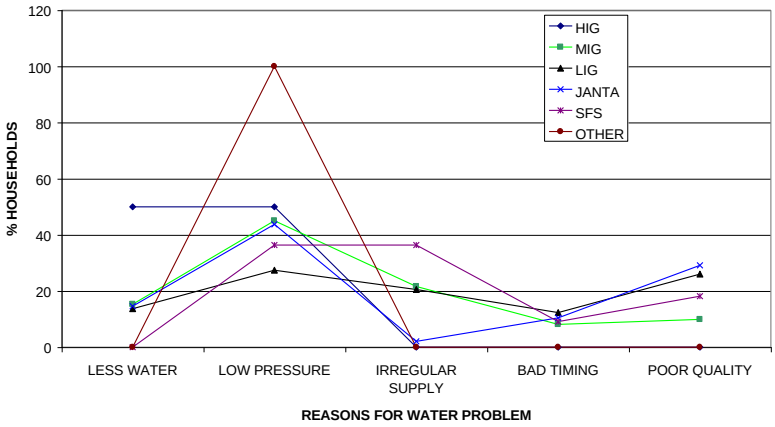
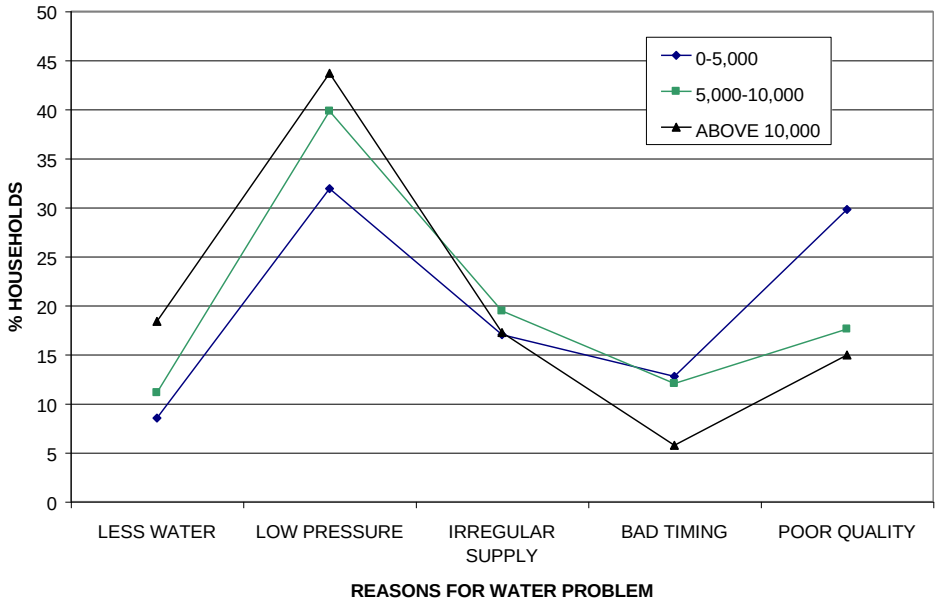


Figure 9.3 (E) : REASONS FOR WATER PROBLEM-BY INCOME (EAST)



- In the North, less water was identified as the second most significant problem after low pressure. 29% of LIG and 30% of MIG (Fig.9.1-N), 34% of second floor and 33% of third floor (Fig.9.2-N), and 27% of the rich (Fig.9.3-N) households said they faced this problem.

Figure 9.1 (N) : REASONS FOR WATER PROBLEM-BY TYPE (NORTH)

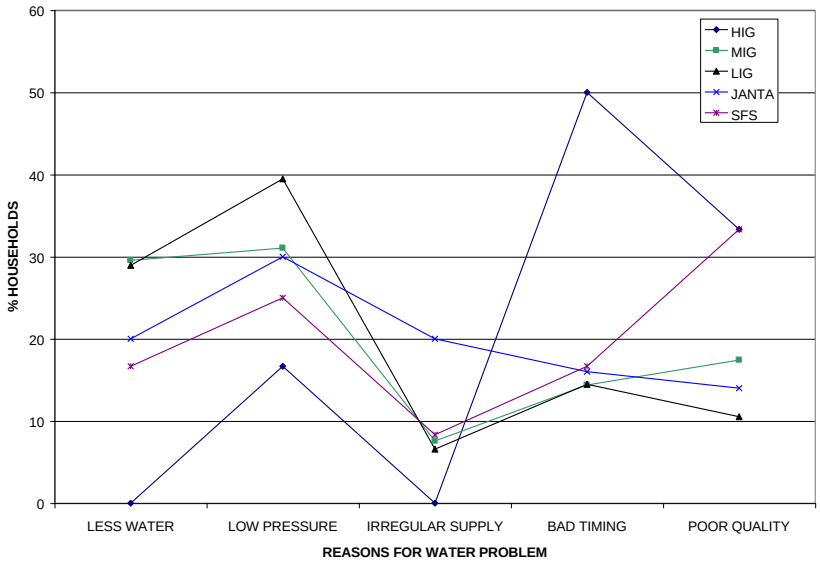


Figure 9.2 (N)REASONS FOR WATER PROBLEM-BY FLOOR (NORTH)

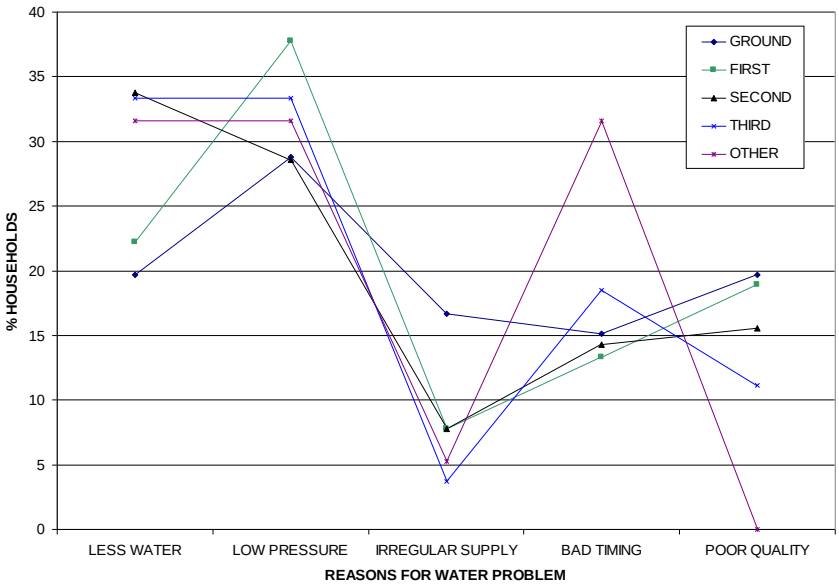
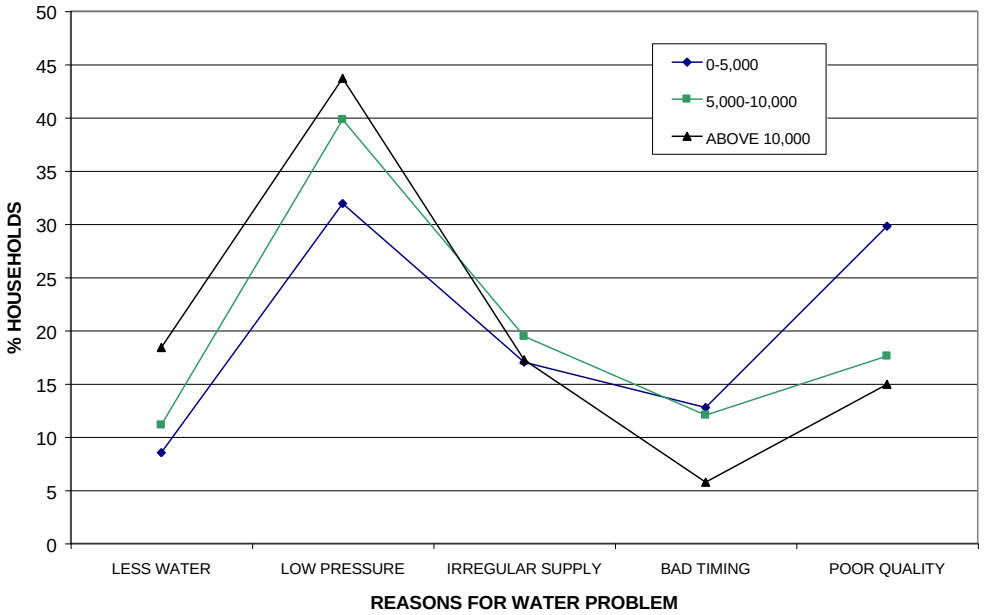
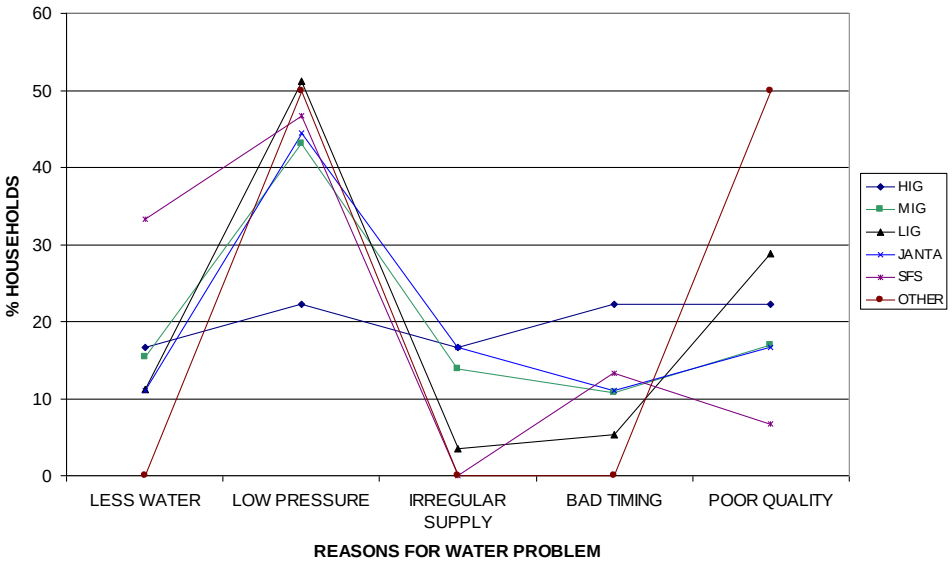


Figure 9.3 (N) : REASONS FOR WATER PROBLEM-BY INCOME (EAST)



- In the West, poor quality dominated the perception of respondents. 29% of LIG (Fig.9.1-W), 26% of first floor and 27% of second floor (Fig.9.2-W), and 25% of the rich (Fig.9.3-W) residents were the most articulate on this count.

Figure 9.1 (W) : REASONS FOR WATER PROBLEM-BY TYPE (WEST)



- In the South, bad timing was important for 35% of Janata and 32% of LIG (Fig.9.1-S), 27% of ground floor (Fig.9.2-S), and 27% of poor and 26% of middle (Fig.9.3-S) respondents. Other problems mentioned were irregularity by 25% HIG (Fig.9.1-S), and less water by 25% second floor (Fig.9.2-S) residents.

CONSUMPTION, REQUIREMENT, STORAGE, AND SATISFACTION

To give an overall picture of the perception of respondents, tables have been generated to compare consumption with requirement, storage, and satisfaction/dissatisfaction by Type (Table 10.1), by Floor (Table 10.2), and by Income (Table 10.3) groups.

Table 10.1: Comparisons by Type

(all figures as household percentages)

Type of flat	*Parameter*	*Total*	*East*	*North*	*West*	*South*
JANATA	Consumed	78	***95***	75	***95***	69
<150 lpcd	Required	85	***97***	82	83	81
	Stored	76	***94***	***98***	71	60
	Satisfied	80	***97***	67	-	74
	Dissatisfied	76	***95***	77	92	65
LIG	Consumed	69	77	**58**	72	**57**
<150 lpcd	Required	74	85	73	68	64
	Stored	80	83	***93***	81	**53**
	Satisfied	74	79	67	78	**59**
	Dissatisfied	**58**	58	**50**	69	**54**
MIG	Consumed	**59**	75	**48**	**48**	**58**
<150 lpcd	Required	67	84	**56**	62	**58**
	Stored	70	75	73	69	62
	Satisfied	67	80	**59**	**51**	67
	Dissatisfied	68	**55**	**37**	**42**	**55**
HIG	Consumed	67	-	78	64	61
<200 lpcd	Required	67	-	77	88	**47**
	Stored	76	-	***95***	***100***	**50**
	Satisfied	70	-	71	64	-
	Dissatisfied	66	-	***100***	65	**59**
SFS	Consumed	66	86	***92***	73	**46**
<200 lpcd	Required	66	71	76	87	**52**
	Stored	71	**46**	83	***90***	61
	Satisfied	64	-	89	79	**32**
	Dissatisfied	66	-	***100***	68	**55**
OTHERS	Consumed	75	-	-	-	73
<200 lpcd	Required	74	-	-	-	80
	Stored	79	-	-	-	***92***
	Satisfied	69	-	-	-	-
	Dissatisfied	80	-	-	-	-
% response	Sat./Dissat.	42/41	55/31	35/41	43/43	33/49

[- indicates no response or less than 10 households responding]

Table 10.2: Comparisons by Floor

(all figures as household percentages)

Floor	*Parameter*	*Total*	*East*	*North*	*West*	*South*
GROUND	Consumed	65	81	67	**59**	**56**
<150 lpcd	Required	72	88	72	66	64
	Stored	69	86	80	72	**55**
	Satisfied	68	86	64	**51**	60
	Dissatisfied	**59**	68	70	63	**52**
FIRST	Consumed	66	80	61	66	**58**
<150 lpcd	Required	70	85	62	67	66
	Stored	72	75	79	79	**58**
	Satisfied	72	80	72	70	63
	Dissatisfied	61	81	**56**	62	**55**
SECOND	Consumed	63	83	**52**	61	**44**
<150 lpcd	Required	69	88	62	65	**49**
	Stored	75	82	81	77	**51**
	Satisfied	69	81	62	68	**39**
	Dissatisfied	**58**	86	**49**	**55**	**43**
THIRD	Consumed	61	66	**51**	62	60
<150 lpcd	Required	72	79	79	**55**	64
	Stored	78	75	94	-	**58**
	Satisfied	70	71	**58**	81	-
	Dissatisfied	**49**	**57**	**41**	**42**	**55**
OTHER	Consumed	**49**	70	**17**	-	73
<150 lpcd	Required	60	82	**45**	-	-
	Stored	79	**45**	89	-	89
	Satisfied	**52**	-	-	-	-
	Dissatisfied	**44**	-	-	-	-
% response	Sat./Dissat.	42/41	55/31	35/39	43/43	33/48

Table 10.3: Comparisons by Income
(all figures as household percentages)

Income (Rs)	*Parameter*	*Total*	*East*	*North*	*West*	*South*
POOR (<5,000)	Consumed	63	69	66	62	**51**
	Required	70	76	67	68	63
<100 lpcd	Stored	66	75	85	69	**39**
	Satisfied	64	71	72	**55**	**51**
	Dissatisfied	62	67	63	65	**53**
MIDDLE (5-10,000)	Consumed	65	78	**46**	65	61
	Required	73	84	65	71	68
<150 lpcd	Stored	78	77	89	85	60
	Satisfied	69	77	**44**	71	70
	Dissatisfied	61	78	**49**	60	**53**
RICH (>10,000)	Consumed	75	89	79	68	68
	Required	78	***94***	80	75	69
<200 lpcd	Stored	79	77	85	79	68
	Satisfied	81	***93***	85	72	69
	Dissatisfied	70	80	73	65	68
% response	Sat./Dissat.	40/40	53/31	33/37	42/43	33/48

In the above tables, all percentages above 90 and below 60% have been highlighted to provide for easier interpretation. These tables are useful for emphasising the following important trends with respect to what may be an appropriate norm for water consumption for different groups (the category of 'Others' has been generally ignored in the analysis):

Table 10.1 (by Type)

In this Table an arbitrary norm of 150 lpcd has been set for the lower groups such as Janata, LIG, MIG, and another of 200 lpcd for the higher groups of HIG and SFS. This has been done to enable a comparison to be made based on the earlier observation that the higher groups tend to consume more water.

- While for the total sample the satisfied and dissatisfied households are equally divided into 42% and 41% of the sample, the residents of the East have more satisfied flats (55%)

than dissatisfied ones (31%). But the situation is reversed in the North (35%satisfied to 41% dissatisfied) and in the South (33%:49%).

- 58% of the dissatisfied in the LIG flats and 59% of the MIG residents are consuming less than 150 lpcd. This would indicate that a lower norm of 150 lpcd and a higher one of 200 lpcd are generally acceptable.
- The Janata flats in the East are clearly finding 150 lpcd to be an adequate norm, with 95% consuming less than that, 97% requiring less, 94% storing as much and 97% of the satisfied households using the same amount. It is only in the SFS flats in the East that 46% are storing less than 200 lpcd, which means that most people there are storing more in order to meet their requirements.
- In the North, 98% of the Janata and 93% of the LIG flats are storing less than 150 lpcd, which can be interpreted to mean that supply is problematic in their areas. This is supported by the MIG figures also, wherein 48% are getting less than 150 lpcd, only 56% say they can do with that much and as low as 37% of the dissatisfied belong to this category of consumers. In the HIG and SFS flats, all the dissatisfied are getting less than 200 lpcd and this indicates that this amount may not be perceived to be adequate for their needs. Figs.9.1-Nand 9.3-N support this interpretation, while Fig. 4.2 shows that as many as 47% in this zone have installed motors to pump water.
- In the West 95% of the Janata residents are receiving less than 150 lpcd, but only 48% of the MIG residents are getting that (while 56% feel they can do with that much, and only 37% of the 41% dissatisfied are receiving that). Both in the HIG and SFS flats, 90-100% residents are storing less than 200 lpcd. This strongly suggests that there is sufficient water available in this zone but it may not be reaching the consumers adequately. This is borne out by Figs.9.1-W and 9.3-W wherein 46-47% of the residents blame low pressure for the water problem in their area.

- The South represents the most discontented section, since most of the percentages are less than 60%. Clearly, this is not because of lack of water because the percentage receiving less than the norm varies from 46% (for SFS) to 69% (for Janata). In other words, as much as 30-50% of the population in the South is getting water above the norm. It is also noticeable that, except for the HIG flats, all the others are getting more water than they require. Yet the dissatisfaction levels are the highest for all the zones. This may have something to do with the higher level of affluence in the zone (Fig.1-S) as well as the complaints about low pressure, irregular supply, and inconvenient timings (Fig.9.1-S).

Table 10.2 (by Floor)

In this Table a different approach has been adopted to assess whether there are problems between floors as far as water supply is concerned. Hence, the norm fixed here has been 150 lpcd for all floors, regardless of Type.

- In the total sample, the only percentages below 60% are of those dissatisfied households consuming less than 150 lpcd. This is highest (61%) for the first floor residents and lowest (49%) for the third floor residents. Thus 40-50% of all residents are actually getting higher than the norm of 150 lpcd but are still dissatisfied, and this cuts across all floors. This confirms the argument that the problem is not one of quantity but of pressure, irregularity, and quality.
- The East appears to have less problems, except perhaps at the third floor level, because all the percentages are in the 80s.
- In the North the problems increase even though they are getting more water than in the East. The same may be said to be true for the West.

- It is in the South that the problems become evident for all floors, including the ground floor, even though for over 40% of residents more water is available than the norm of 150 lpcd.

Table 10.3 (by Income)

Here the norm has been changed again to try and assess whether different income groups would be satisfied with differential norms. Hence, the norm for the poorer households has been set at 100 lpcd, that for the middle group is 150 lpcd, and for the rich it is 200 lpcd.

- For the total sample all the percentages lie between 60-80%, and consumption is consistently higher than requirement. So, it may be inferred that such a differential norm would satisfy over two-thirds of the population.
- In the East the gap between supply (consumed) and demand (required) is 5-7 percentage points and storage is of the same order as consumption for the two lower categories. Therefore, satisfaction levels are expectedly high (53%).
- The gap in the North between supply and demand is high only for the medium group, the others seem to be in consonance with the given norms.
- Even in the West there is a gap of 6-7 percentage points between supply and demand. Hence, satisfaction is affected more by low pressure and poor quality than by quantity (Figs.9.1-W and 9.3-W).
- In the South the main problem appears to be with the poorer households since they have to store more water than the norm to meet their requirements. This is possibly because of the complaints about bad timings from this zone (Figs.9.1-S and 9.3-S).

SEWERAGE PROBLEMS

Respondents were asked to list the problems with drainage blockages. The options given were of blockage in the bathroom, toilet, kitchen, or manhole. The responses were then correlated against Type and Floor. The results are plotted in Figs.11.1 to 11.4 for different types, and Figs.12.1 to 12.4 for different floors. The interpretation of these graphs has focussed on the peaks in the curves and the total percentage of households up to the peak.

Interpretation by Type

- Figs. 11.1 to 11.4 show that the percentage of responses for bathroom blockage is 36%, toilet blockage is 35%, kitchen blockage is 43% and manhole blockage is 47%. Thus, clearly, the blockages in the kitchen and the colony sewer are more significant for the community.
- The peaks for the Janata and LIG flats occur at a total consumption level less than 300 litres and they are distributed over all the four causes, with the manhole being slightly more significant for the Janata flats.
- The peaks for the MIG and SFS flats occur at the 500 litres consumption level. But for MIG the causes are distributed over toilet, kitchen, and manhole; while for SFS the main cause appears to be toilet blockage.
- HIG flats show the peak occurring at the highest consumption level of less than 1000 litres, and the causes are distributed over toilet, kitchen, and manhole.
- In the East, bathroom blockage is high for LIG, MIG, and HIG, while SFS flats complain about kitchens.
- In the North, Janata blockage is highest in the bathroom. LIG blockage is at the kitchen and manhole, while MIG flats complain heavily about all four causes: but it should be

noted that the peaks are at higher levels of total water consumption (<1000 litres) than the average for these categories.

- In the West complaints are distributed over all causes for both MIG and HIG, with HIG complaining more. SFS flats identify blockages in the toilet and manhole, but at higher levels of total water consumption (<1000 litres).
- In the South, too, MIG and HIG residents complain about blockages at all points, while SFS flats focus on baths and toilets (at higher levels of water consumption).

Interpretation by Floor

- Figs. 12.1 to 12.4, for the total sample, show that there is little variation in the pattern of different floors, with complaints distributed over all four causes. Blockages at the toilet and kitchen peak at 300 litres consumption for the bottom and top floors and 300-500 litres for the middle ones, while blockages at the manhole are all reported at total consumption of 300 litres.
- In the East blockages for all causes in the ground floor are at the 300 litres level, while manhole blockages for all floors is also at less than 300 litres consumption. Bathroom blockages peak when consumption is between 500-1000 litres.
- In the North blockages at all four points is reported when consumption in the ground floor is between 300-500 litres, in the first floor it is <300 litres, and in the upper floors it is between 500-1000 litres.
- The West reports blockages at the lower levels of water consumption. Peaks for the upper floors and for manhole blockages are all at less than 300 litres consumption.
- Blockages at all points in the South are at 300 litres consumption for the ground floor, and 500 litres for the first, second, and third floors.

CONCLUSIONS

1. Ownership of DDA flats is not generally along the lines of the various demarcated categories. Thus, more affluent families are occupying the flats meant for economically weaker sections, particularly in the South and West.
2. Per capita consumption averages around 100-150 lpcd, but it is lower for the East and higher for the South.
3. The main water use is for washing and the ownership of washing machines does not appear to make a significant difference to water use patterns.
4. Total consumption of water is lower (<300 litres) for Janata and LIG flats and higher (<1000 litres) for HIG flats.
5. As residents' income levels go up per capita water consumption also increases. But the East and South zones are at opposite ends of this trend.
6. The major source of water is the tap followed by the tap with motor, and the latter increases average per capita consumption from 150 to 200 lpcd. The North has the highest percentage of motors.
7. As the number of bathrooms and toilets increases so does the per capita consumption. However, in the East the consumption is lower compared to the other zones.
8. The requirement of water is reported to be lower for the lower categories (150 lpcd) and the lower income groups (100 lpcd) than for the higher groups (200 lpcd), while there is no significant difference between various floors. The flats in the East demand less water and the Southern flats say they need more.
9. The Janata, LIG, MIG and poorer families are storing less water (150 lpcd) than the others (200 lpcd). The East and North store significantly less than the South.

10. Satsified and dissatisfied residents are equally distributed (about 40%) in the total population. But the East has more satisfied water users (55%) while the North and South have more dissatisfied consumers (41% and 49% respectively).
11. Dissatisfaction levels appear to go up with rising income even though water consumption is increasing. There is little variation in this regard across floors.
12. The main reason identified by respondents for their dissatisfaction is the low pressure at which water is supplied.
13. The other significant reasons are poor quality in the East and West, less water in the North, and bad timings, irregular supply, and less water in the South.
14. A comparison between water supplied, demanded, stored, and the level of consumption at which dissatisfaction is expressed indicates that quantity of water is not the major issue, but the pressure and regularity of supply.
15. Additionally, an analysis of consumer behavior according to different norms suggests that the lower income groups would be satisfied with 100 lpcd, the middle income groups with 150 lpcd, and the higher income groups with 200 lpcd, provided the supply is at adequate pressure, regular, and of good quality.
16. This consumer behavior could be used to set a minimum supply norm of 100 lpcd at a no-cost no-profit rate, while all supply above this norm could be charged for through a sliding scale which would encourage water conservation and proper use.
17. An analysis of drainage blocks that manholes (that is, colony sewers) and kitchens are identified as the main points of blockage.
18. Except for the North, and partially the South, much of this blockage is correlated to low levels of total water consumption (300 to 500 litres). Where water consumption goes up to 1000 litres it begins to block bathrooms and toilets.
19. This seems to indicate that colony level sewer systems have been over-designed to carry larger quantities of sewerage, while the household level drains cannot carry higher loads.

20. Hence, both systems have to be designed around the norm of 100 to 200 lpcd, depending upon the type of flat.