
APPENDIX-P

PUBLIC ATTITUDE SURVEY

**APPENDIX P
PUBLIC ATTITUDE SURVEY**

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APPENDIX P PUBLIC ATTITUDE SURVEY

P1 INTRODUCTION

P1.1 General

Public Attitude Survey is one of the field surveys under this Study and the survey results are reported in this supporting report. Survey was carried on sample population through direct interview at household using a questionnaire. It was conducted by West Kenya Development Consultancy under the supervision of JICA Study Team and GOK counterpart.

P1.2 Purpose of the Survey

Purpose of the survey was to investigate public awareness/attitude of the residents of Kisumu Municipality by conducting a questionnaire survey. The major items of public awareness/attitude for investigation were:

- level of satisfaction and needs of community of water supply and sewerage/sanitation
- health conditions (water-related diseases)
- sanitary habits
- knowledge of the causes of diseases (its relationship to sanitary habits)
- knowledge of environmental protection
- household income
- willingness-to-pay (WTP)
- affordability-to-pay (ATP)

P2 METHODOLOGY

P2.1 Surveyed Areas

Survey area is within the Kisumu Municipality and four different areas, namely water-supplied area, non-water supply area, sewer-served area and unsewered area were selected. Since water supply and wastewater disposal are related to each other, samples were distributed among the four areas as shown in Table P-1. Names of the localities in each area are also shown in that table. Total number of samples was 200 households. Summary of breakdown of the samples by area is as follows:

Water supplied and sewer served (water and sewer)	- 75 samples
Water supplied and unsewered (water only)	- 50 samples
Water not supplied and sewered (sewer only)	- 25 samples
Water not supplied and unsewered (no water and sewer)	- 50 samples

Localities were selected considering the following:

- type of water supply (house-connection / common stand posts)
- treatment and disposal method of night soil and grey-water
- type of houses
- income level

Figure P-1 shows the location of the areas and the characteristics areas are as follows.

P2.1.1 Water Supplied and Sewer Served Area (Water and Sewer)

These areas are located in what was the old town of Kisumu Municipality and are served by municipal water supply system and sewerage system. Most of the municipal estates are located in this area including high income estates like Milimani. Drainage of the area is good due to high elevation and murram soils. It consists mainly of what was the old town.

P2.1.2 Water Supplied and Unsewered Area (Water Only)

This area is also mainly in the old town. However, sewerage service is not provided to the informal settlements within the old town area. These settlements include, Kaloleni and Manyatta Arab to mention a few. These areas form part of the peri-urban areas of Kisumu Municipality which are not served by sewer but most of them are not supplied with water at least during limited duration of the day.

P2.1.3 Water not Supplied and Sewered Area (Sewer Only)

Category of this area is peculiar and signifies the state of water supply in Kisumu Municipality. This area constitutes mainly Migosi, a middle-income settlement and adjacent informal settlement where water supply pipelines and sewer were laid in the past. However, due to inadequate capacity of Kisumu Municipal Water Supply System, water is not supplied to this area. The population relies on groundwater with private and shared wells, 'springs' and streams. Middle-income households with private wells discharges to sewers while those in the informal settlement rely on pit latrines. Lower part of the area has black cotton soils and the upper part is of murram soils. Lower area is prone to flooding.

Table P-1 Areas and Localities for Public Attitude Survey





Service		Sewerage	
		served (50 samples)	unserved (50 samples)
Water Supply	Supplied (50 samples)	75 Samples 1. Lumumba - 5 2. Milimani - 15 3. Mosque - 5 4. Okore - 5 5. Usaid - 5 5. Makasembo - 5 6. Ondiek - 5 7. Lower Railway - 5 8. Upper Railway - 5 9. Arina - 5 10. Nubian - 5 11. Obunga - 5 12. Tom Mboya - 5	50 Samples 1. Manyatta 'A' - 15 2. Nyalenda - 15 3. Nyamasaria - 5 4. Nyawita - 5 5. Mambolco - 5 6. Kaloleni - 5
	Not-supplied (50 samples)	25 Samples 1. Migosi - 25	50 Samples 1. Bandani - 5 2. Airport - 5 3. Wachara - 5 4. Ober Kamoth - 5 5. Dago - 5 6. Sabembe - 5 7. Nyalunya - 5 8. Nyahera - 5 9. Osiri - 5 10. Chiga - 5

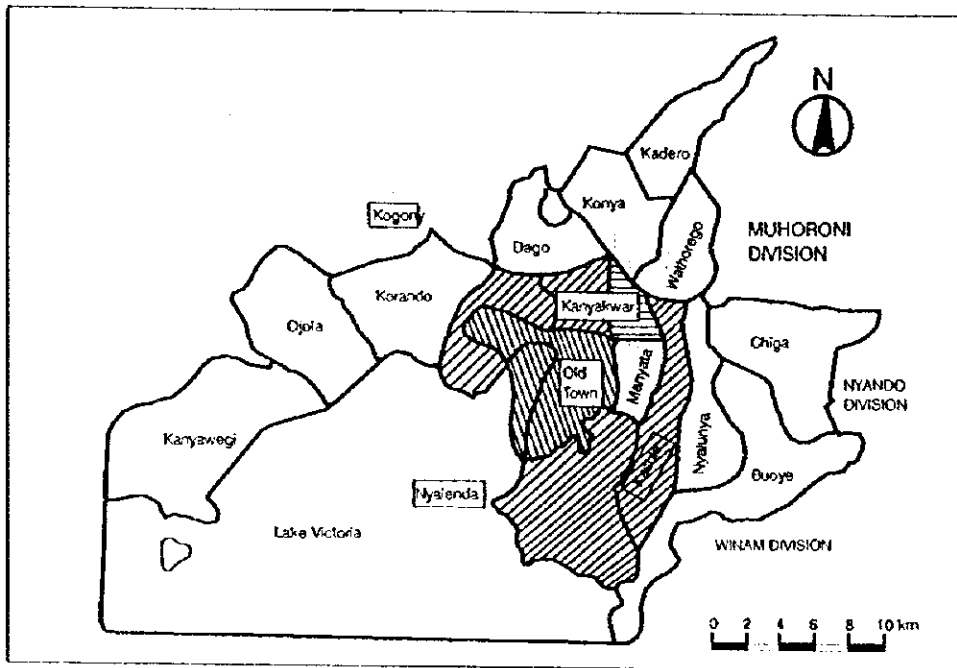
Note: Generally, sewerage system does not exist in non-water supply areas. However, in Kisumu Municipality, there is an area (most part of Migosi) which is piped and seweraged but water supply does not reach due to inadequate capacity. This area is upper middle-income area and relies on groundwater and served by sewerage. Twenty five samples are allocated for this area.

P2.1.4 Water not Supplied and Unsewered Area (No water and sewer)

Most of these areas constitutes rural areas of Kisumu Municipality. Most of the area is characterised by black cotton soils and water logging during rainy seasons which is evident in Nyalunya, Chiga and Nyamasaria. However, areas like Kajulu at higher altitudes has red soil and has good natural drainage allowing easy construction of pit latrines. Population in these areas rely on springs, shallow wells, ponds, lake, streams and canals.

Figure P-1

	AREA	NO. OF SAMPLES	
1.	Water and Sewer	75	
2.	Water Only	50	
3.	Sewer Only	25	
4.	No water and Sewer	50	



THE REPUBLIC OF KENYA

THE MINISTRY OF LOCAL AUTHORITIES
KISUMU MUNICIPAL COUNCIL

THE STUDY
ON KISUMU WATER SUPPLY
AND SEWERAGE SYSTEM

JAPAN INTERNATIONAL COOPERATION
AGENCY

TITLE

Sample Locations for Public
Attitude Survey

P2.2 Data Collection Method

Interviewing method by visiting each household was used, supplemented by observations by the interviewers. The following activities formed the data collection process. They are as follows:

- **Mobilisation of human and material resources** (which included two social surveyors, eight interviewers and a vehicle with driver): Eight interviewers were recruited from the locality to carry out the interview. These facilitated gaining access to the households, made interviewing in the local language possible and helped to build rapport during the interviews. Interviewers had previous experience in similar surveys and were briefed about data collection techniques and on the questionnaire. Interviewers were under the direct supervision of either survey coordinator or survey administrator.
- **Pretesting** : Interviewers were subsequently taken to the field for trial interviews to pre-test the questionnaire and to ascertain the techniques of the interviewers. The questionnaire was scrutinised to identify misunderstanding in the wording of questionnaire and to establish a common understanding among the survey team.
- **Interviewing** : Interviewers were instructed to set a suitable atmosphere for interview. They stimulated the discussion and guided the respondents during the interview. At the end of the interview respondents were given a chance to ask questions for clarification.

P2.3 Questionnaire Design

The questionnaire consisting of both open-ended and closed questions to cover items on water supply, sanitation, health and environmental protection was designed in consultation with counterparts of Ministry of Local Government and Kisumu Municipal Council. Questionnaire form is as shown in Annex P1.

P2.4 Data Processing and Analysis

Answers to the questionnaire was coded for data entry and analysis. Annex P2 shows the codes used and Annex P3 shows the coded data for each sample.

P3 RESULTS

Results of the survey are summarised in Figures P-2 through P-12 and in Tables P-2 through P-16. Discussion of the results are made in the following sections.

P3.1 Household

P3.1.1 Household Size

Average family size for the whole sample was 7.12 persons. The average is the highest for water and sewer area at 7.56 and the smallest was for water only area at 6.44 persons. Compared to the population census data, family size of the samples are slightly higher.

Table P-2 Average Household Size

Area	Average Size, (persons)
Water and sewer	7.12
Water only	6.44
Sewer only	7.52
No water and sewer	7.12
Total	7.12

P3.1.2 House Type

Type of houses characterise the living conditions of the surveyed area. As a whole 56% of the respondents live in permanent houses, 30% live in semi-permanent houses and 14% live in temporary houses. Majority of the permanent houses are found in Water and Sewer Area, and Sewer Only Area with 86% and 84% of the respondents living in such houses, respectively. The majority of the semi-permanent houses found in the No Water and Sewer and Water Only areas with 56% and 42% of the respondents living in such houses respectively. Most of the temporary houses are found in the No Water and Sewer Area and water only area that accounts for 32% and 18% respectively. Figure P-2 illustrates the details for house types for each area.

P3.1.3 Electricity and Telephone

Access to other utilities namely electricity and telephone are also indicators of living conditions of the Study Area. As expected, access to electricity and telephone are the highest in Water and Sewer Area at 98% and 27% respectively. In the water only area, it is 18% and 20% respectively. Unique characteristic of Sewer Only Area is shown by 88% electricity connections and 8% telephone connections. In the No Water and Sewer Area, only 2% respondents have electricity and none of them have telephone. Figure P-3 shows the details.

P3.2 Water Supply Needs

P3.2.1 Water Sources

Results from the survey indicate that the respondents use a variety of water sources. The sources include, the municipal water supply, community supply, public wells, private wells, streams/canals, springs and Lake Victoria.

A detailed analysis indicates that in the Water and Sewer Area, the municipal water supply is commonly used, which accounts for 85.3% respondents having house connections. Community water supply accounts for 4% of the house connections (which includes private wells supplying several houses), while 9.3% of the respondents depend on communal taps from Community Water Supply (wells supplying neighbouring residents).

In Water Only Area, the main source of water is the municipal water supply, which accounts for 48% relying on communal taps, 10% have house connections from community water supply. In the sewer only area, the major source of water is private wells which accounts for 80%.

Municipal water supply does not serve people in the no water and sewer area. The main source of water is private wells which account for 32% respondents. There are no house connections in this area. Figure P-4 illustrates water sources for each area.

P3.2.2 Water Collection

Regarding the frequency of water collection, most of the respondents (61.5%) in the surveyed areas collect water more than three times a day, 32% collect it thrice a day while 6.5% collect it twice a day or less.

The highest frequency of water collection is observed in the sewer only area with 92% of the respondents collecting water more than three times a day. This is followed by No Water and Sewer Area with 62%, Water and Sewer Area has 57.3% and Water Only Area has 52%.

The common mode of water collection is carrying water on heads/hands by individual household members accounting for 47% of respondents followed by 23% of the respondents depending on handcarts. A few rely on bicycles, wheelbarrows, and even cars.

The time taken to collect water varies from one area to another. In the Water and Sewer Area, an average of 10 minutes is spent on water collection due to its proximity to households (85.3%) who have house connections. In the Water Only Area, an average of 25 minutes is spent on water collection while in the Sewer Only Area, approximately an hour is spent on collecting water. In the No Water and Sewer Area, an average of 33 minutes is spent on water collection. For the entire study area, an average time of 32 minutes is spent on collecting water daily.

P3.2.3 Distance to Water Sources

As a whole, 59.5% of the respondents travel up to 0.5 km, 36% travel between 0.5-1.0 km and only 4.5% travel more than 1 km. By areas, the respondents who travel more than 1 km come from No Water and Sewer Area (18%) while 62% from the same area travel between 0.5-1 km looking for water. Figure P-5 gives the details on distance to water source. It should be noted that even in the Water and Sewer Area, although 85% has house connections, due to unreliable supply, 85% of those in Water and Sewer Area also responded with travel up to 0.5km for water.

P3.2.4 Payment for Water

The survey investigated whether or not the residents were paying for water. The results indicate that 39% of all respondents do not pay for water because they are not supplied. Others use traditional sources such as rivers, wells, springs, lake which do not require any payment. 38% respondents, who pay for water, buy it directly from water vendors. Table P-3 below show the average payment (median) for water. Expenditure for water in water-scarce areas (i. e. water only, and sewer only) is higher than the expenditure in relatively well supplied area (water and sewer)

Table P-3 Monthly Payment for Water

Area	Ksh. /month
Water and sewer	225
Water only	302
Sewer only	331
No water and sewer	148

P3.2.5 Satisfaction with Water

Table P-4 shows the summary of satisfaction with water. Obviously most of the population is not satisfied with the water supply both municipal and others. It is essential to note that between 34-46% of those in No Water and Sewer Area are, however, satisfied with way of collection, water quantity and water quality. Table P-13 shows the satisfaction with water against payment for water. Figure P-6 shows the satisfaction with water use.

Table P-4 Satisfaction with Water

Area	way of collection	quantity	quality	price
Water and sewer	35	25	23	17
Water only	36	32	24	32
Sewer only	8	24	4	16
No water and sewer	34	40	34	46

P3.3 Sewerage / Sanitation Needs

P3.3.1 Mode of Nightsoil/Sewage Disposal

As a whole, only 38.5% are served by the sewer. The most common form of sanitation is pit latrine with 40% of the respondents using this form of faecal disposal, 13.5% use common latrines, 10.5% are connected to septic tanks, 2% use bucket latrines and 0.5% are connected to the cesspit. Figure P-7 shows the details of nightsoil/sewage disposal.

Table P-5 shows the summary of night soil/sewage disposal mode by area. A comparative analysis of sanitation methods in the four survey areas indicates that in the Water and Sewer Area 75% of respondents have flush toilets connected to sewer, 3% have flush toilets connected to septic tanks. Pit latrines are used by 15% of the respondents while common latrines are used by 5%.

In the Water Only Area, 2% are connected to sewer while 30% are connected to septic tanks. 60% use pit latrines. In Sewer Only area 76% of respondents depend on flush toilets, 16% use pit latrines and 4% use common latrine. In the No Water and Sewer area, 70% of the respondents use pit latrines, while 34% use common latrines. Other 8% use toilets connected to septic tanks and 4% use bucket latrine.

Table P-5 Mode of Nightsoil/Sewage Disposal (% of samples)

Area	Flush Toilet / Sewer	Flush Toilet / Septic Tank	Pit Latrine	Common Latrine	Others
Water and sewer	75	3	15	5	7
Water only	2	30	60	10	0
Sewer only	80	0	16	4	12
No water and sewer	0	8	70	34	4

Note : Some of the households use multiple mode of night soil disposal especially those using pit latrine and common latrine in day and night.

P3.3.2 Satisfaction with Night Soil/Sewage Disposal

Table P-6 shows the summary of response to satisfaction with night soil/grey water disposal. Most of the respondents in Water Only and Sewer Only areas were not satisfied with the way they dispose night soil / sewage. In No Water and Sewer Area where almost all population relies on either pit latrines or common latrines, only 40% are satisfied especially due to distance from household and inconvenience during rainy weather and during night. Figure P-8 shows the details. Cases where people have fell into the pit latrine due to substandard construction has also occurred discouraging their use.

Table P-6 Satisfaction with Night Soil /Sewage Disposal

Area	% satisfied
Water and sewer	53
Water only	24
Sewer only	24
No water and sewer	40

P3.4 Garbage Disposal

There is no organized system of garbage collection in Kisumu Municipality. As a whole, 5.5% of the respondents throw it on the street, 54.5% in open land outside their property and 40% inside their property. In the Water only area, the streets are littered with garbage(8%), while in the Sewer Only Area 88% of the respondents throw garbage in the open land outside their property, most of which end up into drainage channels and sewers, clogging them. Also, when it rains the garbage is washed into canals, rivers and lake. In Water and Sewer Area, most of the people (58.7%) dispose their garbage inside their property. Results are shown in Figure P-8 .

P3.5 Health Conditions

Malaria is endemic in the Study Area and all the respondents have affected with it once or more. Table P-7 shows the summary of other water-related diseases among respondents.

Table P-7 Common Diseases (Except Malaria)

Area	% Affected		
	Diarrhoea	Typhoid	Cholera
Water and sewer	40	69	8
Water only	62	82	16
Sewer only	44	44	0
No water and sewer	68	84	22

Water-related diseases in the study area is prevalent with malaria affecting all areas. For the Water and Sewer Area, typhoid accounts for 69.3% and diarrhoea 40%. In the Water Only Area, typhoid accounts for 82% and diarrhoea 62%. In the Sewer Only Area there is no incidence of cholera. Diarrhoea and typhoid account for 44% each. In the No Water and Sewer Area, residents suffer from water-related diseases, with diarrhoea accounting for 68%, typhoid 84%, and cholera 22%. Other diseases account for 52%. Figure P-9 illustrates the prevalence of common diseases in each area. It is important to note that the outbreak of cholera in the second week of October 1997 started from the No Water and Sewer Area.

Due to high frequency of malaria and typhoid, people have to spend money on medicines. The results indicate that 43.5% spend over Ksh. 1000 per month on medicines.

P3.6 Knowledge of the Causes of Diseases

The results of the survey indicate that 70% of all the respondents boil water for drinking, 81% wash hands with soap before eating and after use of toilet and 83.5% cover food/water.

In the water and sewer area, 77.3% boil water, 80% wash hands and 77.3% cover food. In water only area, 64%, 94% and 96% boil water, wash hands and cover food respectively. In the sewer only area, 88% boil water, 80% wash hands and 92% cover food. In no water and sewer area, 56% boil water, 70% wash hands and 76% cover food/water.

Boiling water is highly practiced in the sewer only area while washing of hands and covering food is highly practiced in water only area. The lowest rated area in terms of sanitary habits is found in no water and sewer area (Table P-16).

In contrast to the prevalence of water-related diseases, that the respondents were aware of the causes of diseases, boil water for drinking and wash hands with soap before meal and after the use of toilet. One of the common reason is lapses in practice due to unavailability of clean water and cost of fuel for boiling water.

P3.7 Knowledge of Environmental Pollution/Protection

Figure P-10 and Table P-12 show the results.

P3.8 Household Expenditure

Household income forms one of the quantitative measure of affordability to pay for services such as water and sewerage. However, experience suggested that the people are reluctant to disclose their income even when asked to specify in the ranges instead of figures compared to expenditure. Therefore, respondents were asked to disclose the household expenditure. Since the savings rate is low, it can be safely assumed that expenditure is nearly equal to income, especially for low-income categories. Figure P-11 shows results and Table P-8 shows the summary. As shown in that table, Water and Sewer Area and Sewer Only Area has relatively high income while the lowest average expenditure was in No Water and Sewer Area. In terms of expenditure for water, low-income people i.e. those in Water Only Area use the highest percentage of their household expenditure for water while those in Water and Sewer Area use the lowest percentage of their expenditure for water.

Table P-8 Average (median) Household Expenditure

Area	Ksh. /month	Average payment for water as % of household expenditure, %
Water and sewer	8,400	2.68
Water only	4,050	7.46
Sewer only	8,000	4.14
No water and sewer	3,750	3.95

P3.8 Willingness-to-Pay and Affordability-toPay

More often than not willingness-to-pay is strongly related to affordability of a service or good. When the price is high the commodity is less affordable and more people are not inclined to pay for it. However, not in all cases does inability to pay reflect unwillingness to pay. At this juncture, it would suffice to say that willingness-to-pay has to do with both attitude and affordability. The results from the survey confirm that all the respondents in the entire sample were willing to pay for water.

Figure P-12 shows the results of Willingness-to-Pay. Analysis of different areas shows that in Water and Sewer Area, 8% of the respondents are willing to pay up to Ksh 50 a month for water, 14% are ready to pay Ksh.100 while another 37.3% can pay up to. Kshs. 200 monthly. 40% can pay over Ksh. 200.

In Water Only Area 6% of the respondents are willing to pay up to Ksh. 50 for water, 22% up to Ksh. 100 while 42% are willing to pay upto 200, and 30% are willing to pay more than Ksh. 200.

In the Sewer Only Area, 8% are willing to pay less than Ksh. 50. 20% are willing to pay Kshs. 50 - 100 while 36% pay upto Ksh. 200. 36% are willing to pay more than Ksh. 200 monthly.

In the No water and sewer area, 2% are willing to spend upto Kshs. 50. 50% are willing to pay Kshs.50 - 100 monthly while 47% are willing to spend Kshs. 200. 4% are willing to spend more than Kshs. 200.

Table P-9 summarizes the sample averages of willingness-to-pay for water in each area. In the same table, affordability-to-pay is shown based on rules of thumb i.e. range of 3-5% of average household. Willingness-to-pay is less than what the people are paying at present and is also less than the affordability-to-pay as well.

Table P-9 Willingness to pay (WTP) and Affordability to Pay (ATP) for Water

Area	WTP Ksh. /month	ATP Ksh. /month (3-5% of expenditure)
Water and sewer	130	252 - 420
Water only	115	122 - 203
Sewer only	120	240 - 400
No water and sewer	75	113 - 188

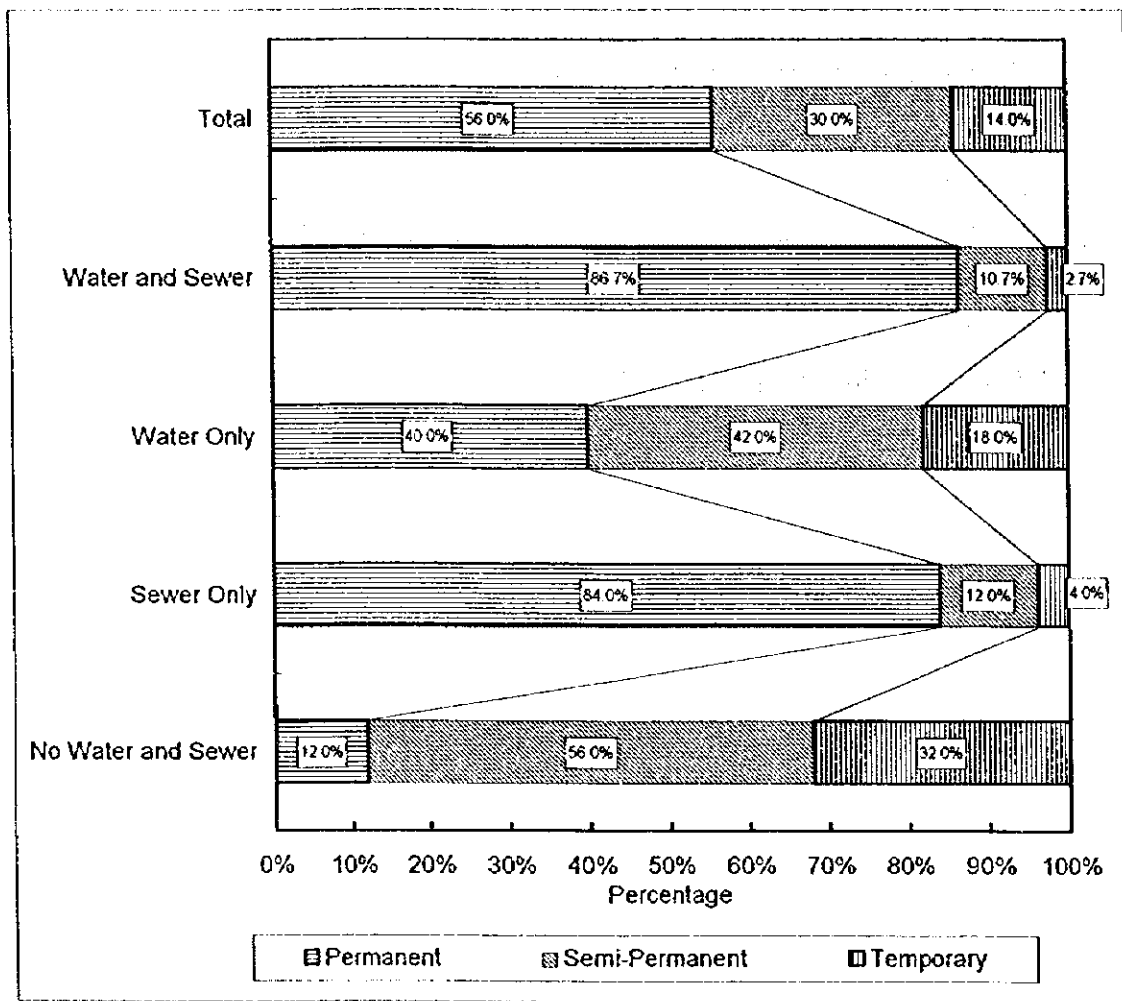
Factors exist that may reduce this willingness. In Water and Sewer Area, 82.7% were dissatisfied with water price. In Water Only Area, 76% were unhappy with water quality. In Sewer Only Area, 92% were dissatisfied with water collection. While 66% were not happy with water collection in no water and sewer area.

P4 CONCLUSIONS

From the survey results and field observations, following conclusions are made:

- Improvement of water supply and sewerage services of Kisumu municipality is very urgent. Especially the poor are spending more for low quality water.
- Minimum charge levied on consumers need revision as the consumers who have not received any or very little water are charged flat rate and are dissatisfied.
- Public opinion is unfavourable on Water and Sewerage Services. Cooperation of public will be essential for successful water supply and sewerage operation and the efforts shall be made to overcome the negative impression.

Figure P-2

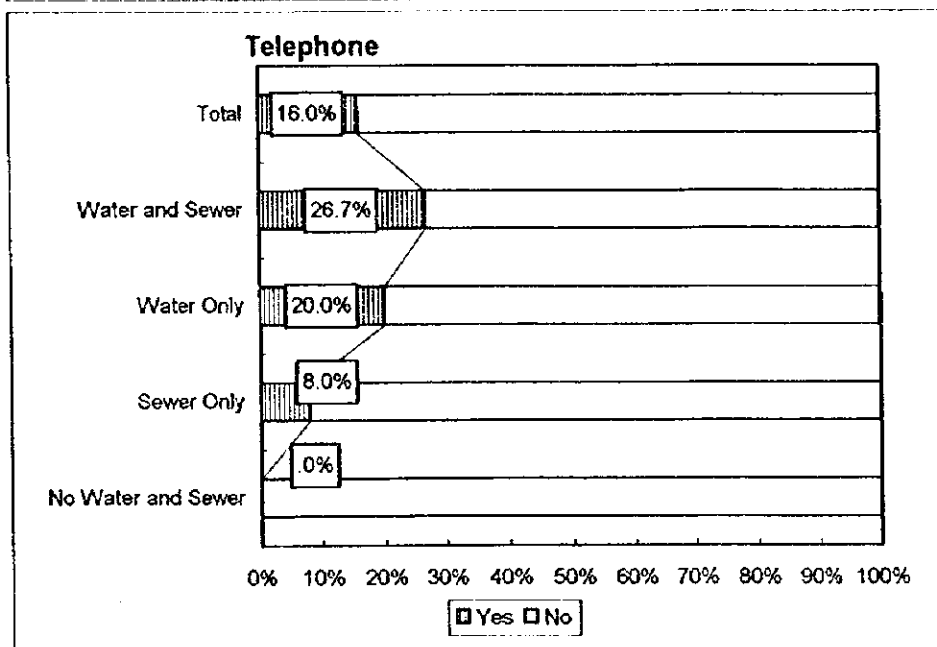
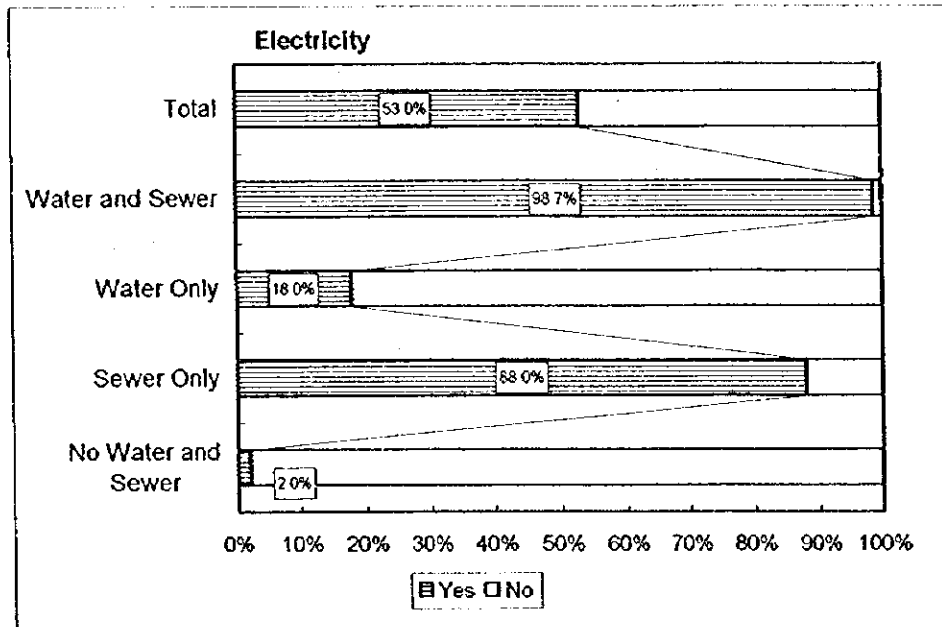


House Type

Area	Permanent		Semi-Permanent		Temporary		Total No. of Samples
	No. of Samples	%	No. of Samples	%	No. of Samples	%	
Water and Sewer	65	86.7	8	10.7	2	2.7	75
Water Only	20	40.0	21	42.0	9	18.0	50
Sewer Only	21	84.0	3	12.0	1	4.0	25
No Water and Sewer	6	12.0	28	56.0	16	32.0	50
Total	112	56.0	60	30.0	28	14.0	200

THE REPUBLIC OF KENYA THE MINISTRY OF LOCAL AUTHORITIES KISUMU MUNICIPAL COUNCIL	THE STUDY ON KISUMU WATER SUPPLY AND SEWERAGE SYSTEM	TITLE Type of Houses
	JAPAN INTERNATIONAL COOPERATION AGENCY	

Figure P-3

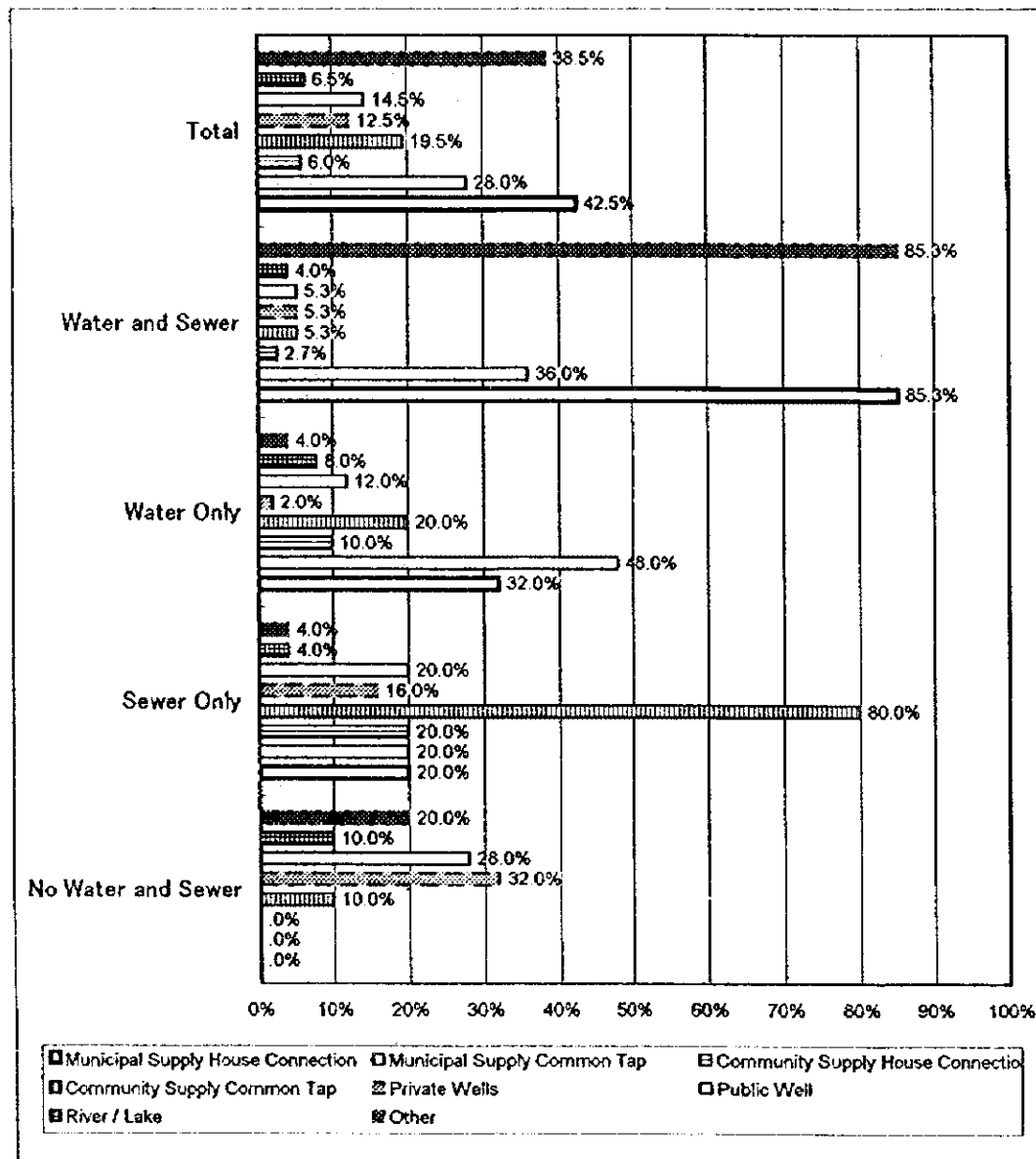


Access to Electricity and Telephone

Area	Electricity				Telephone			
	Yes	%	No	%	Yes	%	No	%
Water and Sewer	74	98.7	1	1.3	20	26.7	55	73.3
Water Only	9	18.0	41	82.0	10	20.0	40	80.0
Sewer Only	22	88.0	3	12.0	2	8.0	23	92.0
No Water and Sewer	1	2.0	49	98.0	0	0.0	50	100.0
Total	106	53.0	94	47.0	32	16.0	168	84.0

THE REPUBLIC OF KENYA	THE STUDY ON KISUMU WATER SUPPLY AND SEWERAGE SYSTEM	TITLE
THE MINISTRY OF LOCAL AUTHORITIES KISUMU MUNICIPAL COUNCIL	JAPAN INTERNATIONAL COOPERATION AGENCY	Access to Electricity and Telephone

Figure P-4



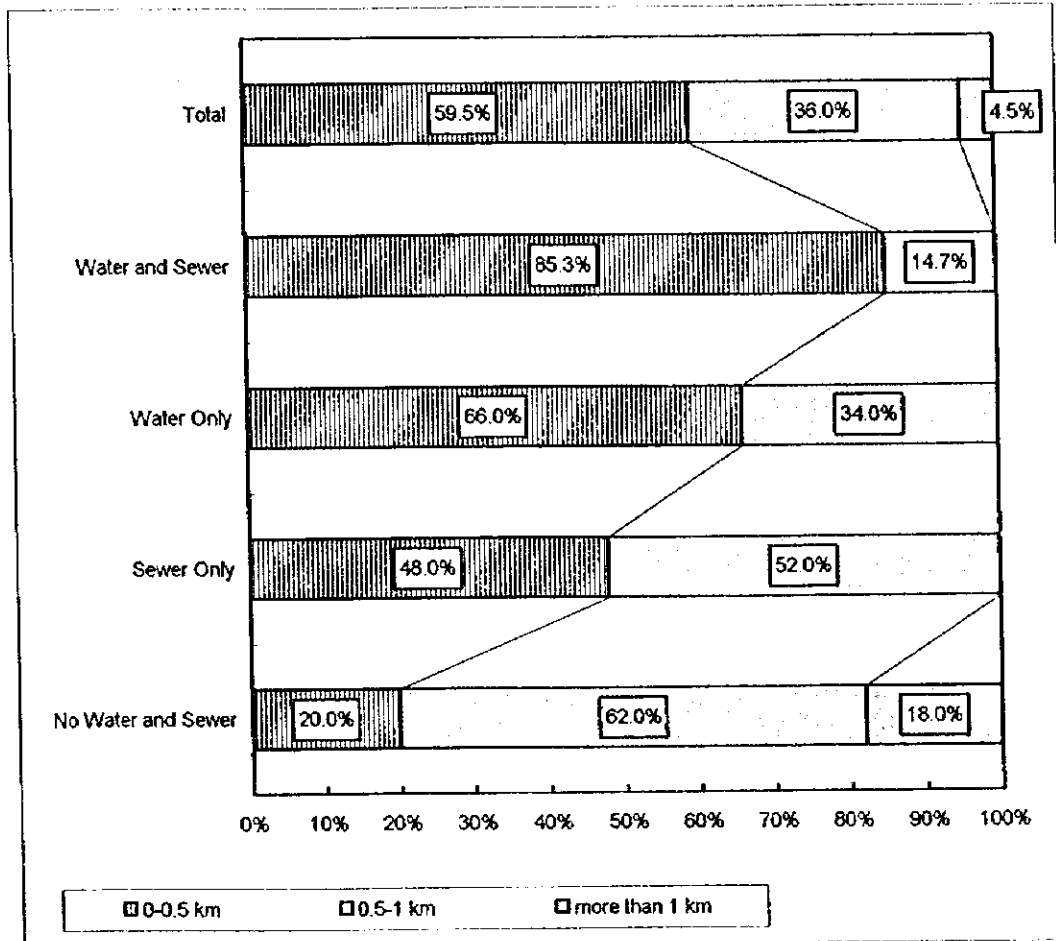
Water Source

Area	Municipal Supply				Community Supply				Private Wells		Public Well		River / Lake		Other	
	House Connection		Common Tap		House Connection		Common Tap		No.	%	No.	%	No.	%	No.	%
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Water and Sewer	64	85.3	27	36.0	2	2.7	4	5.3	4	5.3	4	5.3	3	4.0	64	85.3
Water Only	16	32.0	24	48.0	5	10.0	10	20.0	1	2.0	6	12.0	4	8.0	2	4.0
Sewer Only	5	20.0	5	20.0	5	20.0	20	80.0	4	16.0	5	20.0	1	4.0	1	4.0
No Water and Sewer	0	0.0	0	0.0	0	0.0	5	10.0	16	32.0	14	28.0	5	10.0	10	20.0
Total	85	42.5	56	28.0	12	6.0	39	19.5	25	12.5	29	14.5	13	6.5	77	38.5

Note: Due to unreliable municipal supply, most respondents rely on multiple sources. For example, in Water and Sewer Area, 75 respondents rely on 172 sources which is a factor of 2.3. Other indicates mostly buying from water vendors.

THE REPUBLIC OF KENYA THE MINISTRY OF LOCAL AUTHORITIES KISUMU MUNICIPAL COUNCIL	THE STUDY ON KISUMU WATER SUPPLY AND SEWERAGE SYSTEM	TITLE Water Sources
	JAPAN INTERNATIONAL COOPERATION AGENCY	

Figure P-5



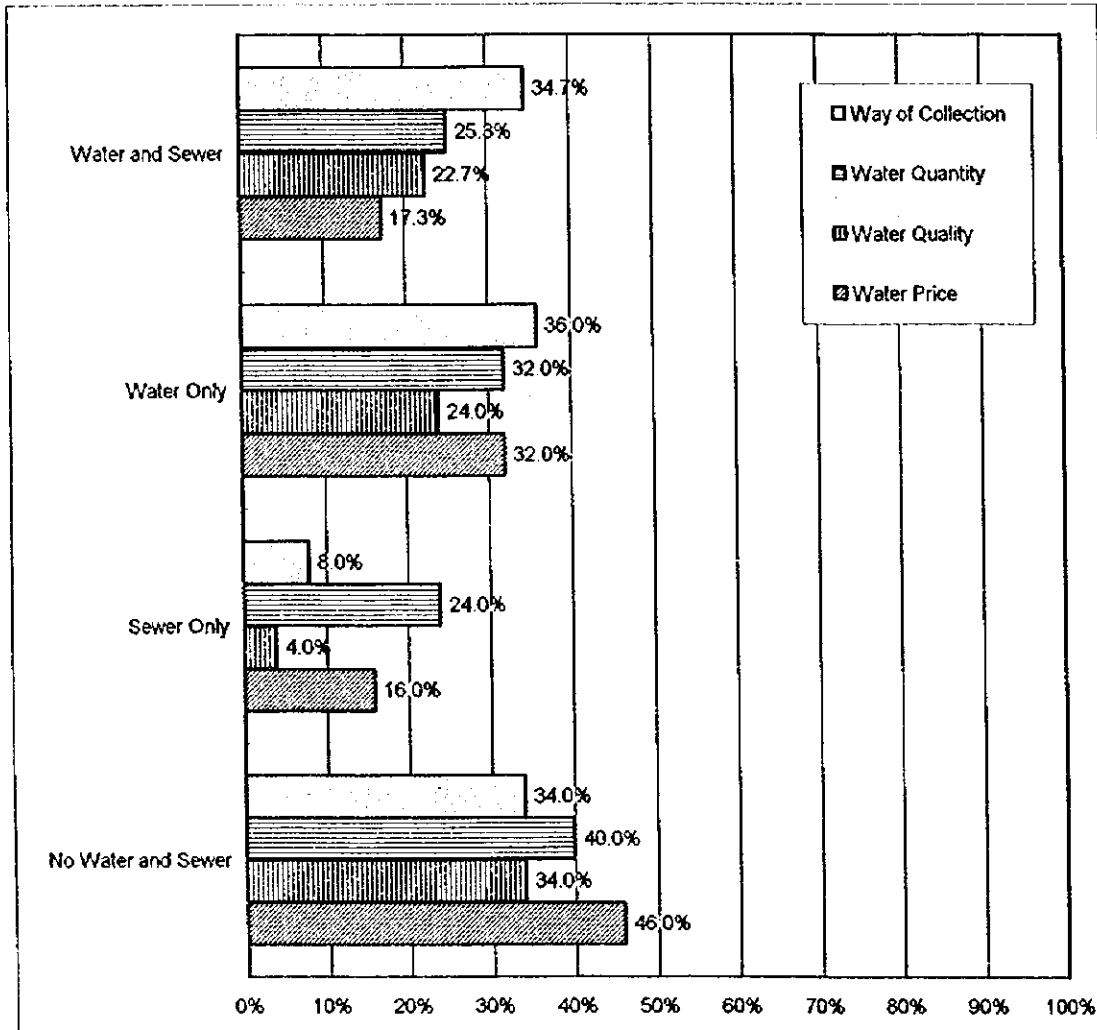
Distance to Water Source

Area	Distance					
	0-0.5 km		0.5-1 km		more than 1 km	
	No.	%	No.	%	No.	%
Water and Sewer	64	85.3	11	14.7	0	0.0
Water Only	33	66.0	17	34.0	0	0.0
Sewer Only	12	48.0	13	52.0	0	0.0
No Water and Sewer	10	20.0	31	62.0	9	18.0
Total	119	59.5	72	36.0	9	4.5

Note: Even in the Water and Sewer Area due to unreliable supply, travel up to 1 km was reported.

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	JAPAN INTERNATIONAL COOPERATION AGENCY	

Figure P-6

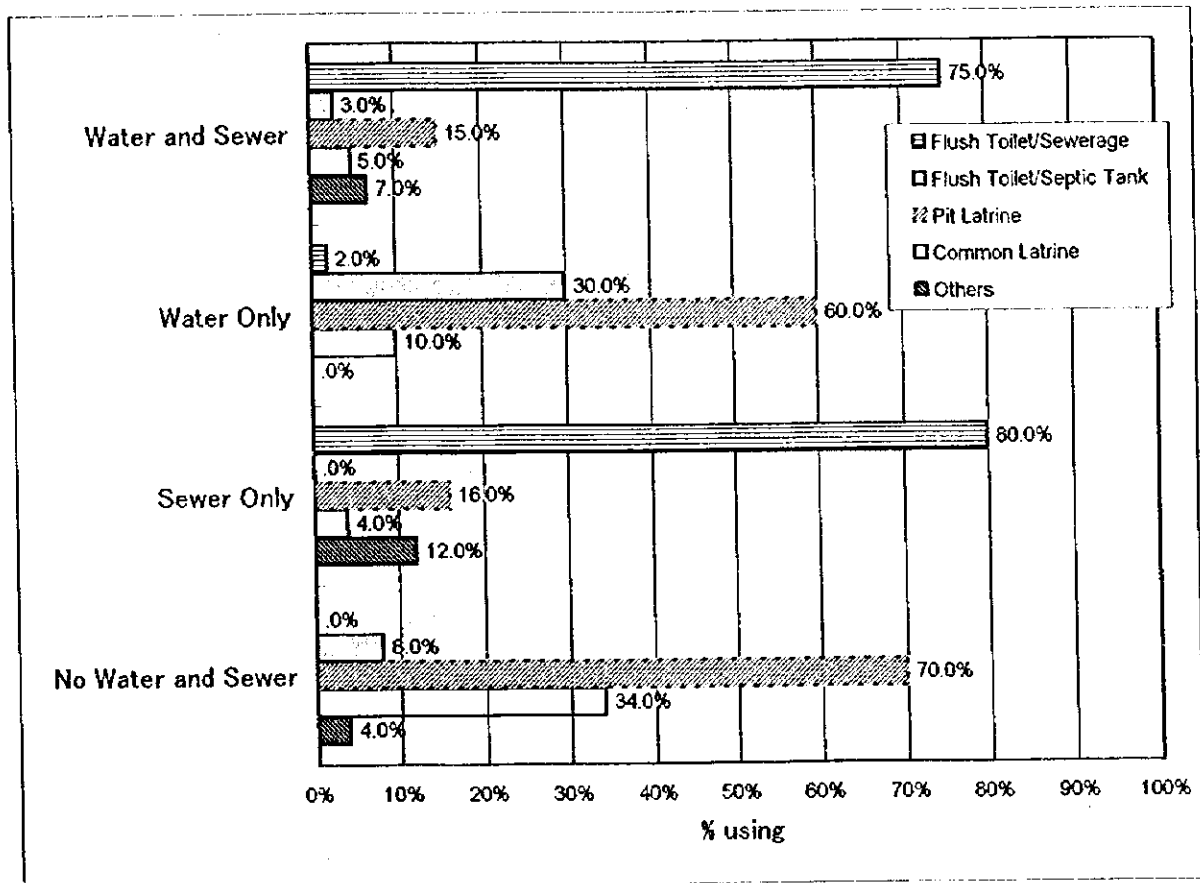


Satisfaction with Water (% satisfied)

Area	Way of Collection	Water Quantity	Water Quality	Water Price
Water and Sewer	34.7	25.3	22.7	17.3
Water Only	36.0	32.0	24.0	32.0
Sewer Only	8.0	24.0	4.0	16.0
No Water and Sewer	34.0	40.0	34.0	46.0

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	JAPAN INTERNATIONAL COOPERATION AGENCY	Satisfaction with Water Use

Figure P-7

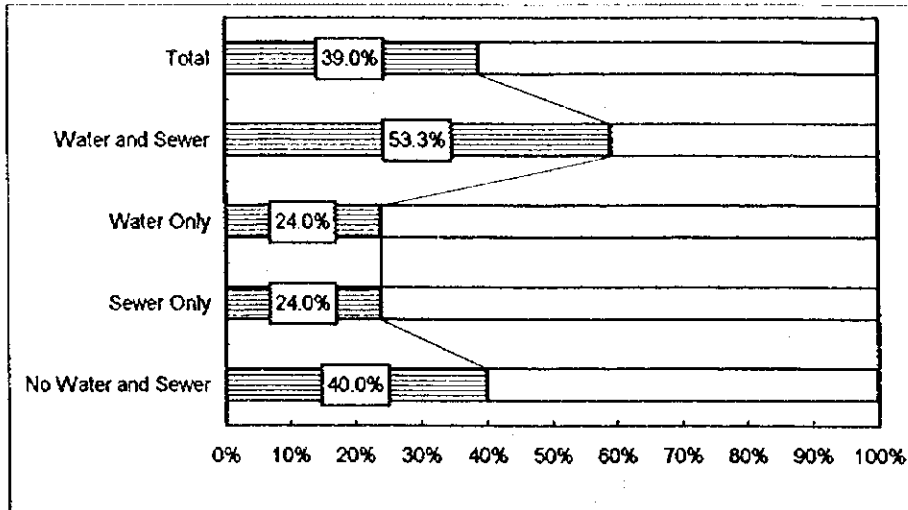


Area	Flush Toilet/ Sewerage	Flush Toilet/ Septic Tank	Pit Latrine	Common Latrine	Others
Water and sewer	75	3	15	5	7
Water only	2	30	60	10	0
Sewer only	80	0	16	4	12
No water and sewer	0	8	70	34	4

Note : Some of the households use multiple mode of night soil disposal especially those using pit latrine and common latrine in day and night.

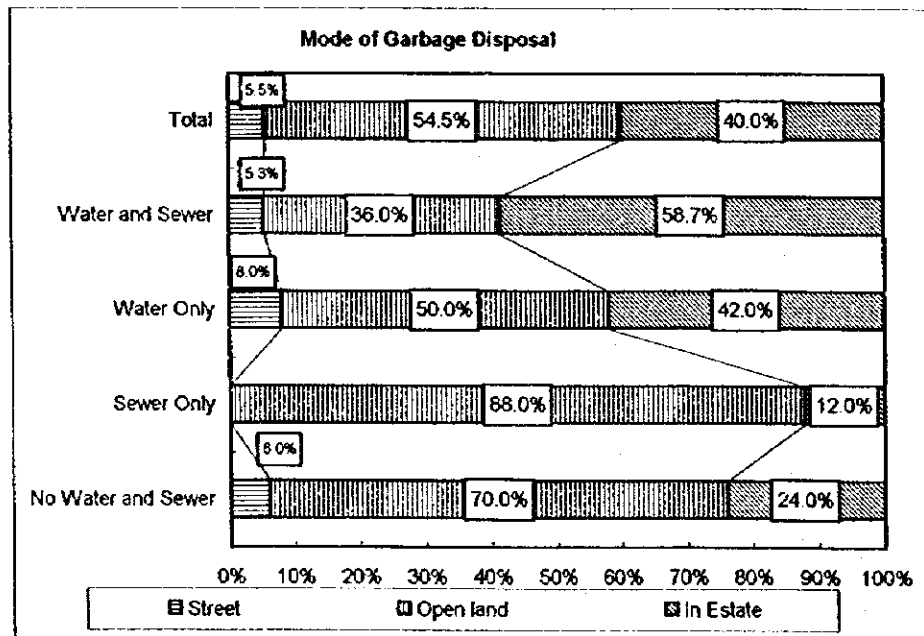
THE REPUBLIC OF KENYA THE MINISTRY OF LOCAL AUTHORITIES KISUMU MUNICIPAL COUNCIL	THE STUDY ON KISUMU WATER SUPPLY AND SEWERAGE SYSTEM	TITLE Mode of Nightsoil / Sewage Disposal
	JAPAN INTERNATIONAL COOPERATION AGENCY	

Figure P-8



Satisfaction with Disposal of Night Soil/Sewage

Area	Yes	%	No.	%	Total
Water and Sewer	40	53.3	35	36.7	75
Water Only	12	24.0	38	76.0	50
Sewer Only	6	24.0	19	76.0	25
No Water and Sewer	20	40.0	30	60.0	50
Total	78	39	122	61	200



Mode of Garbage Disposal

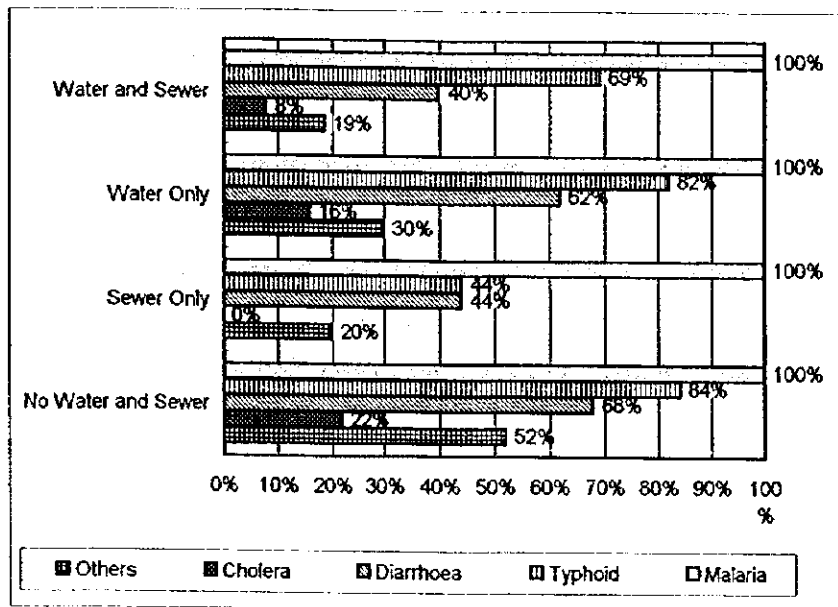
Area	Street		Open Land		In Estate		Total
	Yes	%	Yes	%	Yes	%	
Water and Sewer	4	5.3	27	36.0	44	58.7	75
Water Only	4	8.0	25	50.0	21	42.0	50
Sewer Only	0	0.0	22	88.0	3	12.0	25
No Water and Sewer	3	6.0	35	70.0	12	24.0	50
Total	11	5.5	109	54.5	80	40.0	200

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TITLE
Satisfaction with Nightsoil /
Sewage Disposal and
Mode of Garbage Disposal

Figure P-9



Most Common Diseases

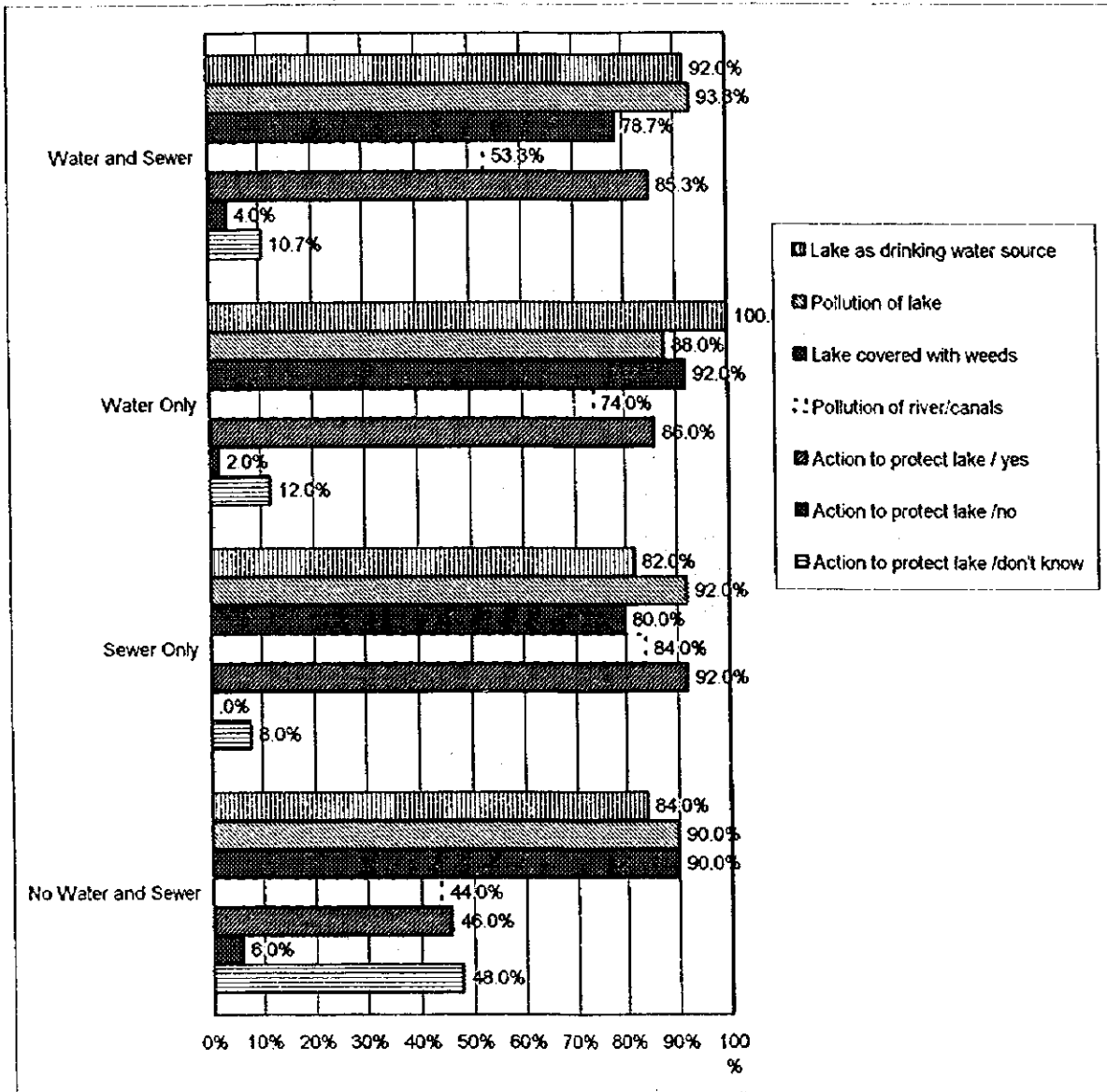
Area	Malaria	Typhoid	Diarrhoea	Cholera	Others
Water and Sewer	100.0	69.3	40.0	8.0	18.7
Water Only	100.0	82.0	62.0	16.0	30.0
Sewer Only	100.0	44.0	44.0	0.0	20.0
No Water and Sewer	100.0	84.0	68.0	22.0	52.0

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TITLE :
Most Common Diseases

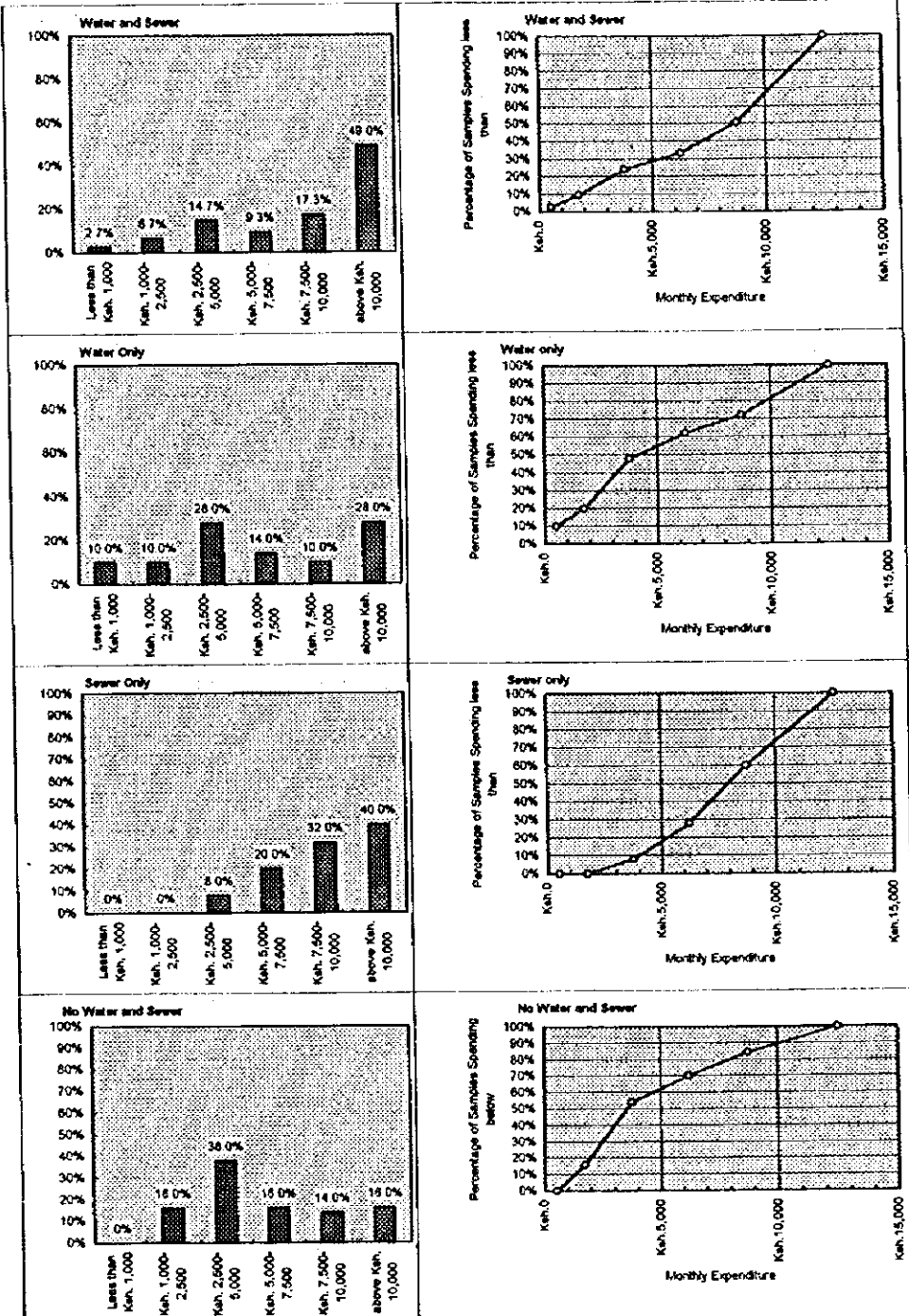
Figure P- 10



Area	Lake as drinking water source % knew	Pollution of lake	Lake covered with weeds	Pollution of river/canals	Action to protect lake		
					% yes	%No	% don't know
Water and Sewer	92.0	93.3	78.7	53.3	85.3	4.0	10.7
Water Only	100.0	88.0	92.0	74.0	86.0	2.0	12.0
Sewer Only	82.0	92.0	80.0	84.0	92.0	0.0	8.0
No Water and Sewer	84.0	90.0	90.0	44.0	46.0	6.0	48.0

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	JAPAN INTERNATIONAL COOPERATION AGENCY	

Figure P-11

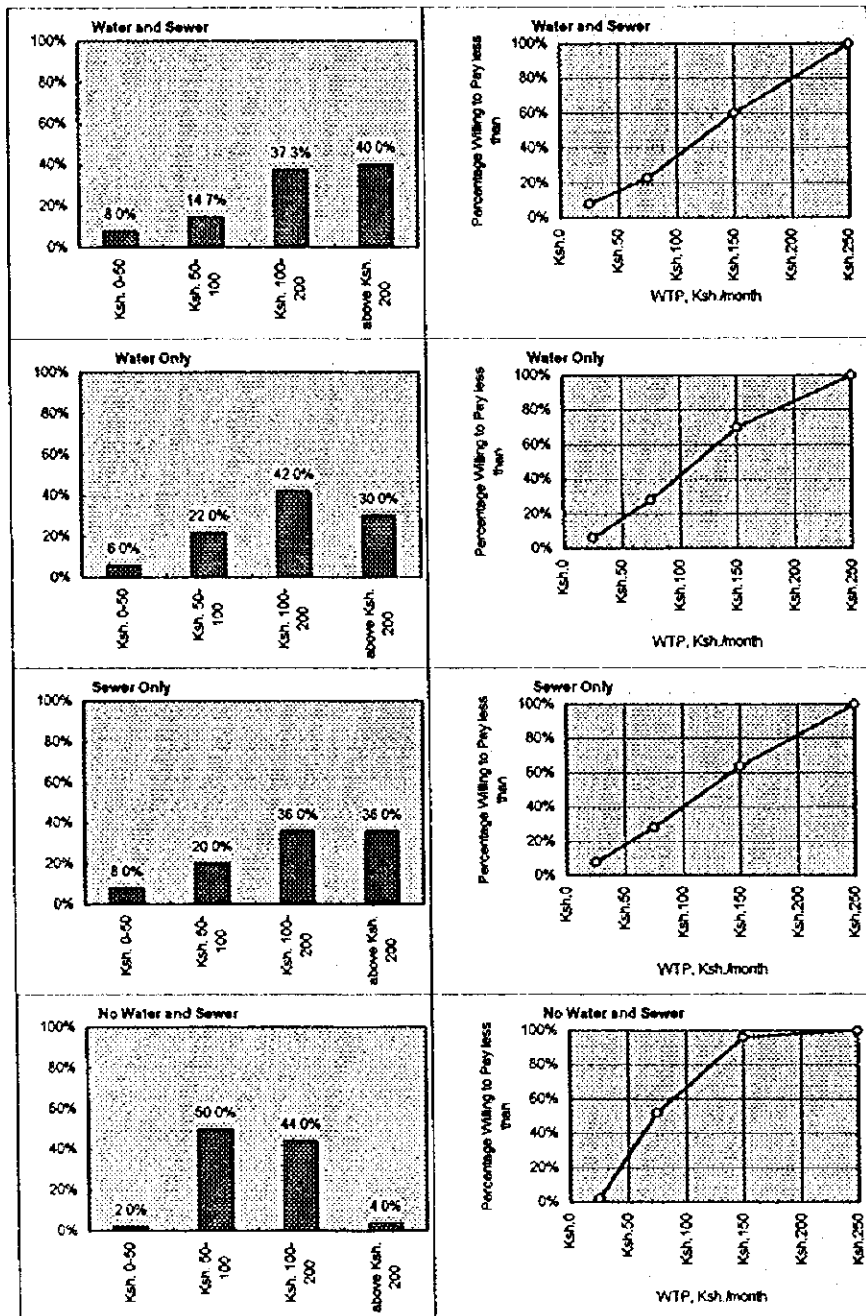


Distribution of Monthly Expenditure						
Area	Less than Ksh. 1,000	Ksh. 1,000-2,500	Ksh. 2,500-5,000	Ksh. 5,000-7,500	Ksh. 7,500-10,000	above Ksh. 10,000
Water and Sewer	2.7	8.7	14.7	9.3	17.3	48.0
Water Only	10.0	10.0	28.0	14.0	10.0	28.0
Sewer Only	0.0	0.0	8.0	20.0	32.0	40.0
No Water and Sewer	0.0	18.0	38.0	16.0	14.0	14.0

Cumulative distribution of Monthly Expenditure (percentage spending less than)						
Area	Ksh 500	Ksh 1,750	Ksh 3,750	Ksh 6,250	Ksh 8,750	Ksh 12,500
Water and Sewer	2.7	9.4	24.1	33.4	50.7	100.0
Water Only	10.0	20.0	48.0	62.0	72.0	100.0
Sewer Only	0.0	0.0	8.0	28.0	60.0	100.0
No Water and Sewer	0.0	18.0	54.0	70.0	84.0	100.0

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Figure P- 12



Distribution of Willingness-to-pay

Area	Ksh. 0-50	Ksh. 50-100	Ksh. 100-200	above Ksh. 200
Water and Sewer	8.0	14.7	37.3	40.0
Water Only	6.0	22.0	42.0	30.0
Sewer Only	8.0	20.0	36.0	36.0
No Water and Sewer	2.0	50.0	44.0	4.0

Cumulative distribution of Willingness-to-pay (percentage WTP less than)

Area	Ksh. 25.0	Ksh. 75.0	Ksh. 150.0	Ksh. 250.0
water and sewer	8.0	22.7	60.0	100.0
water only	6.0	28.0	70.0	100.0
sewer only	8.0	28.0	64.0	100.0
no water and sewer	2.0	52.0	96.0	100.0

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TITLE

Willingness-to-Pay (WTP)

Table P-10 Water Use Practice

Area	Purpose	Municipal Supply				Community Supply				Public Well		Private Well		River/Lake		Others	
		House Connection	%	Common Tap	%	House Connection	%	Common Tap	%	User	%	User	%	User	%	User	%
Water and Sewer	Drinking/cooking	64	85.3%	27	36.0%	2	2.7%	4	5.3%	6	8.0%	4	5.3%	3	4.0%	64	85.3%
	Toilet	64	85.3%	27	36.0%	2	2.7%	4	5.3%	8	10.7%	5	6.7%	-	-	64	85.3%
	Washing Clothes	64	85.3%	27	36.0%	2	2.7%	4	5.3%	6	8.0%	5	6.7%	-	-	64	85.3%
	Cattle/Goats	13	17.3%	4	5.3%	1	1.3%	2	2.7%	4	5.3%	2	2.7%	1	1.3%	-	-
	Garden	7	9.3%	2	2.7%	2	2.7%	2	2.7%	3	4.0%	2	2.7%	4	5.3%	2	2.7%
Water Only	Drinking/cooking	16	32.0%	24	48.0%	5	10.0%	10	20.0%	6	12.0%	1	2.0%	4	8.0%	2	4.0%
	Toilet	16	32.0%	24	48.0%	5	10.0%	10	20.0%	8	16.0%	5	10.0%	3	6.0%	2	4.0%
	Washing Clothes	16	32.0%	24	48.0%	5	10.0%	10	20.0%	8	16.0%	2	4.0%	4	8.0%	2	4.0%
	Cattle/Goats	1	2.0%	2	4.0%	1	10.0%	2	4.0%	4	8.0%	-	-	-	-	-	-
	Garden	-	-	-	-	-	2.0%	-	-	-	-	1	2.0%	2	4.0%	5	10.0%
Sewer Only	Drinking/cooking	5	20.0%	5	20.0%	-	-	20	80.0%	5	20.0%	4	16.0%	1	4.0%	1	4.0%
	Toilet	5	20.0%	5	20.0%	-	-	14	56.0%	9	36.0%	5	20.0%	1	4.0%	-	-
	Washing Clothes	5	20.0%	5	20.0%	-	-	13	52.0%	8	32.0%	1	4.0%	-	-	-	-
	Cattle/Goats	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Garden	-	-	-	-	-	-	-	-	2	8.0%	8	32.0%	14	56.0%	1	4.0%
No Water and Sewer	Drinking/cooking	-	-	-	-	-	-	5	10.0%	16	32.0%	14	28.0%	5	10.0%	7	14.0%
	Toilet	-	-	-	-	-	-	5	10.0%	23	46.0%	4	8.0%	17	34.0%	2	4.0%
	Washing Clothes	-	-	-	-	-	-	5	10.0%	14	28.0%	-	-	20	40.0%	-	-
	Cattle/Goats	-	-	-	-	-	-	5	10.0%	-	-	-	-	7	14.0%	-	-
	Garden	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table P-11 Willingness to Connect to Sewerage

Area	Satisfaction with Disposal of Night Soil/Sewage				Pit Latrine		Common Latrine		Connect to Sewer	
	Yes	%	No	%		%		%		%
Water and Sewer	40	53.0%	35	46.7%	11	14.7%	4	5.3%	16	21.3%
Water Only	12	24.0%	38	76.0%	30	60.0%	5	10.0%	28	56.0%
Sewer Only	6	24.0%	19	76.0%	4	16.0%	1	4.0%	4	16.0%
No Water and Sewer	20	40.0%	30	60.0%	35	70.0%	17	34.0%	22	44.0%
Total	78	39.0%	122	61.0%	80	40.0%	27	13.5%	70	35.0%

Table P-12 Knowledge of Environmental Pollution / Protection

Area	Knew Water from lake used for drinking				Pollution of lake				Weed covering lake				Pollution of river/canals				Agree to Protect Lake					Contribute Money				
	Yes	%	No	%	Yes	%	No	%	Yes	%	No	%	Yes	%	No	%	Yes	%	No	%	Don't Know	%	Yes	%	No	%
Water and Sewer	69	92.0%	6	8.0%	70	93.3%	5	6.7%	59	78.7%	16	21.3%	40	53.3%	35	46.7%	64	85.3%	3	4.0%	8	10.7%	65	86.7%	10	13.3%
Water Only	50	100.0%	-	-	44	88.0%	6	12.0%	46	92.0%	4	8.0%	37	74.0%	13	26.0%	43	86.0%	1	2.0%	6	12.0%	41	82.0%	9	18.0%
Sewer Only	22	82.0%	3	12.0%	23	92.0%	2	8.0%	20	80.0%	5	20.0%	21	84.0%	4	16.0%	23	92.0%	-	-	2	8.0%	17	68.0%	8	32.0%
No Water and Sewer	42	84.0%	8	16.0%	45	90.0%	5	10.0%	45	90.0%	5	10.0%	22	44.0%	28	56.0%	23	46.0%	3	6.0%	24	48.0%	25	50.0%	25	50.0%
Total	183	91.5%	17	8.5%	182	91.0%	18	9.0%	170	85.0%	30	15.0%	120	60.0%	80	40.0%	153	76.5%	7	3.5%	40	20.0%	148	74.0%	52	26.0%

Table P-13 Satisfaction with Water and Current Payment

Area	Water Collection				Water Quantity				Water Quality				Water Price				No Payment		<Ksh.5/day or <Ksh.150/month		Ksh.5-10/day or Ksh.150-300/month		Ksh.10-20/day or Ksh.300-600/month		>Ksh.20/day or >Ksh.600/month	
	Yes	%	No	%	Yes	%	No	%	Yes	%	No	%	Yes	%	No	%	No.	%	No.	%	No.	%	No.	%		
Water and Sewer	22	29.3%	53	70.7%	26	34.7%	49	65.3%	5	6.7%	70	93.7%	3	4.0%	72	96.0%	32	42.7%	5	6.7%	11	14.7%	17	22.7%	10	13.3%
Water Only	16	32.0%	34	68.0%	11	22.0%	39	78.0%	8	16.0%	42	84.0%	6	12.0%	44	88.0%	8	16.0%	8	16.0%	11	22.0%	16	32.0%	7	14.0%
Sewer Only	4	16.0%	21	84.0%	3	12.0%	22	88.0%	5	20.0%	20	80.0%	5	20.0%	20	80.0%	11	44.0%	0	-	2	-	0	-	12	48.0%
No Water and Sewer	15	30.0%	35	70.0%	13	26.0%	37	74.0%	15	30.0%	35	70.0%	40	80.0%	10	20.0%	28	56.0%	2	4.0%	13	26.0%	4	8.0%	3	6.0%
Total	57		143		53		147		33		167		54		148		79		15		37		37		32	

Table P-14 Sanitary Habits and Knowledge of Diseases

Area	Boil Water		Wash hands before eating eating/after use of toilet		Cover food/water		Causes Of Cholera		Use of impure Water causes diarrhoea etc.		Eating before washing hands		Pollution of lake	
	Yes	%	Yes	%	Yes	%	Yes	%	Yes	%	Yes	%	Yes	%
Water and Sewer	58	77.3%	60	80.0%	58	77.3%	70	93.3%	73	97.3%	71	94.7%	69	92.0%
Water Only	32	63.0%	47	94.0%	48	96.0%	44	88.0%	43	86.0%	44	88.0%	41	82.0%
Sewer Only	22	88.0%	20	80.0%	23	92.0%	23	92.0%	25	100.0%	25	100.0%	24	96.0%
No Water and Sewer	28	54.0%	35	70.0%	38	76.0%	40	80.0%	47	94.0%	46	92.0%	39	78.0%
Total	140	70.0%	162	81.0%	167	83.5%	177	88.5%	188	94.0%	186	93.0%	173	86.5%

Table P-15 Household Expenditure Vs Willingness to Pay

Area	Less than Ksh.1000/month		ksh.1000-2500/month		Ksh.2500-5000/month		Ksh.5000-7500/month		Ksh.7500-10,000/month		Above Ksh.10,000/month	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
Water and Sewer	2	2.7%	5	6.7%	11	14.7%	7	9.3%	13	17.3%	37	49.3%
Water Only	5	10.0%	5	10.0%	14	28.0%	7	14.0%	5	10.0%	14	28.0%
Sewer Only	-	-	-	-	2	8.0%	5	20.0%	8	32.0%	10	40.0%
No Water and Sewer	-	-	8	16.0%	19	38.0%	8	16.0%	7	14.0%	8	16.0%
Total	7	3.5%	18	9.0%	46	23.0%	27	13.5%	33	16.5%	69	34.5%

Table P-16 House Type Vs Sanitary Habits

Area	House Type	Boil Water				Wash hands before eating/after use of toilet				Cover food/Water			
		Yes	%	No	%	Yes	%	No	%	Yes	%	No	%
Water and Sewer	Permanent	53	70.7%	16	21.3%	57	75.0%	11	14.7%	56	74.7%	13	17.3%
	Semi-permanent	3	4.0%	1	1.3%	3	4.0%	2	2.7%	2	2.7%	2	2.7%
	Temporary	2	2.7%	-	-	-	-	2	2.7%	-	-	2	2.7%
Water Only	Permanent	19	38.0%	8	16.0%	26	52.0%	1	2.0%	27	54.0%	-	-
	Semi-permanent	10	20.0%	8	16.0%	16	32.0%	2	4.0%	16	32.0%	2	4.0%
	Temporary	3	6.0%	2	4.0%	5	10.0%	-	-	5	10.0%	-	-
Sewer Only	Permanent	21	84.0%	-	-	17	68.0%	4	16.0%	20	80.0%	1	4.0%
	Semi-permanent	1	4.0%	2	8.0%	2	8.0%	1	4.0%	2	8.0%	1	4.0%
	Temporary	-	-	1	4.0%	1	4.0%	-	-	1	4.0%	-	-
No Water and Sewer	Permanent	6	8.0%	3	6.0%	8	16.0%	2	4.0%	10	20.0%	1	2.0%
	Semi-permanent	14	18.7%	12	24.0%	17	34.0%	12	24.0%	23	46.0%	6	12.0%
	Temporary	8	16.0%	7	14.0%	10	20.0%	1	2.0%	5	10.0%	6	10.0%

Table P- 17 House Type Vs Sanitary Facilities

Area	House Type/ Sanitary Facility	Toilet		Bucket Latrine		Pit Latrine		Common Latrine		Others	
		No.	%	No.	%	No.	%	No.	%	No.	%
Water and Sewer	Permanent	65	86.7%	-	-	5	6.7%	4	5.3%	1	1.3%
	Semi-permanent	-	-	-	-	4	5.3%	-	-	-	-
	Temporary	-	-	-	-	2	2.7%	-	-	-	-
Water Only	Permanent	10	20.0%	3	6.0%	10	20.0%	1	2.0%	-	-
	Semi-Permanent	-	-	-	-	16	32.0%	3	6.0%	-	-
	Temporary	-	-	-	-	4	8.0%	1	2.0%	2	4.0%
Sewer only	Permanent	19	76.0%	-	-	1	4.0%	-	-	1	4.0%
	Semi-Permanent	-	-	-	-	2	8.0%	1	4.0%	2	8.0%
	Temporary	-	-	-	-	1	4.0%	-	-	1	4.0%
No Water and Sewer	Permanent	3	6.0%	-	-	7	14.0%	5	10.0%	-	-
	Semi-Permanent	1	2.0%	1	2.0%	16	32.0%	11	22.0%	-	-
	Temporary	-	-	-	3.0%	12	24.0%	1	2.0%	1	2.0%
Total		97	49.0%	3	40.0%	52	40.0%	27	13.5%	8	4.0%

ANNEX P1
FORM OF QUESTIONNAIRE



THE STUDY ON
KISUMU WATER SUPPLY AND SEWERAGE SYSTEM
IN
THE REPUBLIC OF KENYA

QUESTIONNAIRE
FOR
THE PUBLIC ATTITUDE SURVEY

AUGUST 1997

This Survey will form part of the Study on Kisumu Water Supply and Sewerage System funded as one of the technical cooperation programmes to the Republic of Kenya by the Japan International Cooperation Agency (JICA), the Government of Japan. The Study is conducted jointly by the JICA Study Team and Kenyan Counterparts from the Ministry of Local Government and Kisumu Municipal Council.

The sole intention of the survey is to understand public awareness related to water supply / sewerage and environmental protection which is invaluable and essential for formulating improvement measures for the Kisumu Municipality. The Study Team solicits your continued support and cooperation.

No:	Name of Area :	Sub-location:
	Sex of respondent: Male / Female	
Date:	Name of Interviewer:	

A GENERAL

1 Total number of persons in your house (including you) : _____ persons

B WATER SUPPLY / SEWERAGE / AND SANITATION NEEDS

2 Where do you get water for

	Purpose	Kisumu Municipality Supply		Community Supply		Private Well	Public Well	River / Lake	Other
		House Connection	Common Tap	House Connection	Common Tap				
21	drinking / cooking								
22	toilet								
23	washing clothes								
24	cattle / goat etc.								
25	garden								

For those without house connection

3 Who fetches water ?

- 3.1 Father
 3.2 Mother
 3.3 Children
 3.4 Other adults

4 How long do you fetch water ?

- 4.1 less than 10 minutes
 4.2 10 - 30 minutes
 4.3 30 - 60 minutes
 4.4 more than 60 minutes
 4.5 if more than 60 minutes, please state the reason

4.6 _____
 (interviewer to note the approximate distance : 0 - 0.5 km : 0.5 - 1.0 km : more than 1 km)

5 How many times do you fetch water ?

- 5.1 twice a day or less by means of _____

- 5.2 thrice a day by means of _____
- 5.3 more than thrice a day by means of _____
- 6 How much do you pay for water per day or per month?
- 6.1 no payment
- 6.2 less than 5 KSh per day (less than 150 KSh per month)
- 6.3 5 - 10 KSh per day (150 - 300 KSh per month)
- 6.4 10 - 20 KSh per day (300 - 600 KSh per month)
- 6.5 more than 20 KSh per day (more than 600 KSh per month)
- 6.6 Cost of 20 L of water (1 jerry can) _____ KSh
- 7 Are you satisfied with the water you get?
- 7.1 the way of collecting water : yes / no
- 7.2 water quantity : yes / no
- 7.3 water quality : yes / no
- 7.4 water price : yes / no
- 8 How often do you miss water?
- 8.1 every week
- 8.2 few days in a month
- 8.3 during dry season
- 9 Do you store water? If yes with what ?
- 9.1 yes
- 9.2 no
- 9.3 mode of storage _____
- 10 If you don't have house connection, do you wish to have one ?
- 10.1 yes
- 10.2 no
- 11 How do you dispose nightsoil/sewage?
- 11.1 flush toilet connected to sewer
- 11.2 flush toilet connected to septic tank
- 11.3 pour flush toilet connected to septic tank/soakage pit
- 11.4 pour flush toilet connected to soakage pit
- 11.5 pour flush connected to cesspit
- 11.6 bucket latrine
- 11.7 pit latrine
- 11.8 common latrine
- 11.9 others (please specify) _____

- 12 How do you dispose gray water (drain water from kitchen, bathing, washing etc.) ?
- 12.1 to the sewerage
- 12.2 to the septic tank
- 12.3 to the street drain
- 12.4 to the garden
- 12.5 Others (please specify)
- 13 How much do you pay for nightsoil/sewage disposal?
- 13.1 _____ Ksh/month
- 14 If you own a septic tank, how often do you dispose sludge (use exhauster service) and how much do you pay each time?
- 14.1 _____ times a year
- 14.2 _____ KSh./time
- 15 Are you satisfied with the way you dispose nightsoil/sewage/sludge?
- 15.1 yes
- 15.2 no
- 16 If no, please state what improvement would you like?
- 16.1 would like to connect to sewerage system
- 16.2 would like regular exhauster service
- 16.3 would like regular bucket service
- 16.4 other (specify)
- _____
- _____
- _____
- 17 How do you dispose garbage ?
- 17.1 to the street
- 17.2 to the open land (outside your property)
- 17.3 in the estate (inside the property)
- 18 Have your neighbourhood experienced flooding/unsanitary conditions during rainy season ?
- 18.1 yes
- 18.2 no
- 18.3 if yes, how often _____
- 18.4 if yes, is it severe _____

C HEALTH CONDITIONS

19 Which of the following diseases affected you and your family members in the last one year?

- 19.1 None ()
 19.2 Malaria ()
 19.3 diarrhoea ()
 19.4 typhoid ()
 19.5 cholera ()
 19.6 others

20 Which is the most frequent disease?

20.1 _____

21 How much do you pay for medicine for a month?

- 21.1 less than 100 KSh per month
 21.2 100 - 300 KSh per month
 21.3 300 - 1,000 KSh per month
 21.4 more than 1,000 KSh per month

D SANITARY HABITS

22 Do you boil water before drinking?

- 22.1 yes
 22.2 no

23 Do you wash your hands with soap, before meals and after use of toilet?

- 23.1 yes
 23.2 no

24 Do you cover food / water and other utensils?

- 24.1 yes
 24.2 no

24.3 If yes with what? _____

E KNOWLEDGE OF THE CAUSES OF DISEASES (ITS RELATIONSHIP TO SANITARY HABITS)

25 Do you know why diarrhoea and cholera occurs?

- 25.1 yes
 25.2 no

- 26 If you drink impure water, will you fall sick with diarrhoea, cholera etc. ?
- 26.1 yes
- 26.2 no
- 27 If hands are not washed before meals and after use of toilet, will you get diseases like diarrhoea?
- 27.1 yes
- 27.2 no
- 28 Are you aware that discharge of untreated domestic and industrial wastewater pollute Lake Victoria, and fish from Lake Victoria may also become polluted?
- 28.1 yes
- 28.1 no

F KNOWLEDGE OF ENVIRONMENTAL PROTECTION

- 29 Do you know that water from Lake Victoria is being drawn and distributed as drinking water?
- 29.1 yes
- 29.1 no
- 30 Do you know that domestic sewage, industrial wastewater etc. flow in to Lake Victoria and polluting the lake?
- 30.1 yes
- 30.1 no
- 31 Do you know that the lake is becoming covered with weed (water hyacinth) due to pollution?
- 31.1 yes
- 31.2 no
- 32 Whether you think that the rivers and canals around your neighbourhood are becoming polluted?
- 32.1 yes
- 32.2 no
- 32.3 If yes, what is the source _____
- 33 Whether you think that something has to be done to protect further deterioration of Lake Victoria?
- 33.1 yes
- 33.2 no
- 33.3 do not know
- 34 Are you willing to contribute some money to protect the lake and the rivers/canals?
- 34.1 yes
- 34.2 no

G HOUSEHOLD INCOME

35 Type of house (to be filled by interviewer) / ownership

- 35.1 permanent
 35.2 semi-permanent
 35.3 temporary
 35.4 own-house
 35.5 tenant

36 If rented, how much is your rent ?

36.1 _____ KSh.

37 Do you have the following ?

- 37.1 electricity
 37.2 television
 37.3 telephone
 37.4 car / van
 37.5 livestock (chicken, cow, goat etc.)

38 If you have electricity, how much do you pay for electricity?

- 38.1 less than 200 KSh per month
 38.2 200 - 500 KSh per month
 38.3 500 - 1,000 KSh per month
 38.4 more than 1,000 KSh per month

39 What is the range of your monthly expense ?

- 39.1 less than 1,000 Ksh
 39.2 1,000 - 2,500 Ksh
 39.3 2,500 - 5,000 Ksh
 39.4 5,000 - 7,500 Ksh
 39.5 7,500 - 10,000 Ksh.
 39.6 above 10,000 Ksh

H ABILITY-TO-PAY AND WILLINGNESS-TO-PAYfor those served by water supply and sewerage

40 If water supply and sewerage service is improved, how much can you spend per month?

- 40.1 less than 50 KSh per month
 40.2 50 - 100 Ksh. per month
 40.3 100 - 200 Ksh per month
 40.4 more than 200 Ksh. per month

for those served by water supply only(including those served by communal water points)

- 41 If water supply service is improved, how much can you spend per month ?
- 41.1 less than 50 KSh per month
 - 41.2 50 - 100 Ksh. per month
 - 41.3 100 - 200 Ksh per month
 - 41.4 more than 200 Ksh. per month

for those NOT served by water supply

- 42 If water supply service is provided within walking distance, are willing to use it and how much can you spend per month ?
- 42.1 Yes
 - 42.2 No
 - 42.3 less than 50 KSh per month
 - 42.4 50 - 100 Ksh. per month
 - 42.5 100 - 200 Ksh per month
 - 42.6 more than 200 Ksh. per month

ANNEX P2
CODEBOOK



Annex P2 Code Book

Variable	Description	Code
1	AREAS	
	Water and Sewer	1
	Water Only	2
	Sewer Only	3
	No water and Sewer	4
2	SEX OF RESPONDENT	
	Male	1
	Female	2
3	TOTAL NUMBER OF FAMILY MEMBERS	Actual No.
4	WATER SOURCE/USE	
	Kisumu Municipal Water Supply	1
	Community Supply	2
	Private Well	3
	Public Well	4
	River/Lake	5
	Other	6
	Kisumu Municipality Water Supply + Community Supply	7
	Kisumu Municipality Water Supply + Private Well	8
	Kisumu Municipality Water Supply + Public Well	9
	Kisumu Municipality Water Supply + River/Lake	10
	Kisumu Municipal + Other	11
	Community Supply + Private Well	12
	Community Supply + Public Well	13
	Community Supply + River/Lake	14
	Community Supply + Other	15
	River/lake + Private Well	16
	River/Lake + Public Well	17
	River/Lake +Other	18
	Kisumu Municipal + Community Supply + Private Well	19
	Kisumu Municipal + Community Supply + Public Well	20
	Kisumu Municipal + Community Supply + River/lake	21
	Kisumu Municipal + Community Supply + Other	22
	Kisumu Municipal + Community Supply + Private + Public Wells	23
	Kisumu Municipal + Community Supply + Private + Public Wells + River/Lake	24
	Kisumu Municipal + Community Supply + Private + Public Wells + River/Lake + Other	25
	Community + Private Well + Private Well	26
	Private Well + Public Well	27
	Community Supply + Public Well + Other	28
Not Applicable	29	
5	WHO FETCHES WATER	
	Father	1
	Mother	2
	Children	3
	Other Adults	4
	Combination Of Either of the Above	5
6	TIME TAKEN TO FETCH WATER	
	0-10 Minutes	1
	10-30 Minutes	2
	30-60 Minutes	3
	More than 60 Minutes	4
7	APPROXIMATE DISTANCE (km)	5
	0-0.5	1
	0.5-1	2
	more than 1	3
8	TIMES OF FETCHING WATER	
	Twice a day or less	1
	Thrice a day	2
	More than Thrice a day	3

Annex P2 Code Book

Variable	Description	Code
9	WATER PAYMENT PER DAY/MONTH (KSH)	
	No payment	1
	Less than 5/day or 150/Month	2
	5 - 10 /day or 150 - 300/month	3
	10 - 20/day or 300 - 600/month	4
	More than 20/day or more than 600/month	5
10	ARE YOU SATISFIED WITH WATER YOU GET	
	Water Collection	
	YES	1
	NO	2
	Water Quantity	
	YES	1
	NO	2
	Water Quality	
	YES	1
NO	2	
11	HOW OFTEN DO YOU MISS WATER	
	Every Week	1
	Few Days a Month	2
	During dry Season	3
	Not Applicable	4
12	DO YOU STORE WATER	
	YES	1
	NO	2
	Not Applicable	3
13	WOULD YOU WISH TO HAVE A HOUSE CONNECTION IF YOU DO NOT HAVE	
	YES	1
	NO	2
	Not Applicable	3
14	DISPOSAL OF NIGHT SOIL/SEWAGE	
	Flush Toilet connected to sewer	1
	Flush toilet connect to septic tank	2
	Pour flush toilet connected to septic tank/soakage pit	3
	Pour flush connected to cesspit	4
	Bucket Latrine	5
	Pit Latrine	6
	Common Latrine	7
	Others (Specify)	8
	Combination of either of the above	9
15	DISPOSAL OF GRAY WATER	
	Sewerage	1
	Septic tank	2
	Street drain	3
	Garden	4
	Others (specify)	5
	Combination of either of the above	5
16	COST OF DISPOSAL OF NIGHT SOIL/SEWAGE/SLUDGE	
	Kshs. 120	1
	Kshs 240	2
	Kshs 360	3
	Kshs 480	4
	Over Kshs 480	5
	Not applicable	6

Annex P2 Code Book

Variable	Description	Code
17	TIMES OF DISPOSING SLUDGE USING E EXHAUSTER SERVICES	
	Once / year	1
	Twice /year	2
	Thrice / year	3
	Four / year	4
	Twelve /year	5
	Twenty four / year	6
	Not applicable	7
18	SATISFACTION OF DISPOSAL OF NIGHT SOIL/SEWAGE /SLUDGE	
	YES	1
	NO	2
19	IMPROVEMENTS	
	Connect to sewer	1
	Regular exhauster service	2
	Regular bucket service	3
	Others (specify)	4
20	DISPOSAL OF GARBAGE	
	Street	1
	Open Land (Outside your property)	2
	In the estate (Inside the property)	3
	Combination of either of the above	4
21	EXPERIENCE OF FLOODING / UNSANITARY CONDITIONS IN THE NEIGHBOURHOOD	
	YES	1
	NO	2
	If YES How often (Frequent)	
	When it rains	1
	Once/year	2
	Once/4 years	3
	Four times / year	4
	Once /Week/Year	5
	Not applicable	6
	If YES is it severe	
YES	1	
NO	2	
22	DISEASES WHICH HAVE AFFECTED FAMILIES IN THE LAST ONE YEAR	
	Malaria	1
	Diarrhoea	2
	Typhoid	3
	Cholera	4
	Others	5
	Malaria + any other	6
23	FREQUENCY OF DISEASES	
	Malaria	1
	Typhoid	2
	Diarrhoea	3
	Cholera	4
	Others	5
	Malaria + any other	6
24	COST OF MEDICINE A MONTH (Kshs)	
	Less than 100	1
	100 - 300	2
	300 - 1000	3
	More than 1000	4

Annex P2 Code Book

Variable	Description	Code
25	SANITARY HABITS	
	Do you boil drinking water	
	YES	1
	NO	2
	Washing hands before meals and after use of toilet	
	YES	1
	NO	2
	Do you cover food/water and other utensils	
YES	1	
NO	2	
26	KNOWLEDGE OF CAUSES OF DISEASES AND THEIR RELATIONSHIP TO SANITARY HABITS	
	Do you know why cholera occurs	
	YES	1
	NO	2
	If you drink impure water will you fall sick with diarrhoea	
	YES	1
	NO	2
	If your hands are not washed before and after use of toilet will you fall sick with diseases like diarrhoea	
	YES	1
	NO	2
	Are you aware that discharge of untreated domestic and industrial waste water pollute Lake Victoria	
	YES	1
NO	2	
27	KNOWLEDGE OF ENVIRONMENTAL PROTECTION	
	Do you know that water from lake Victoria is being drawn and distributed as drinking water	
	YES	1
	NO	2
	Do you think that domestic sewage and industrial waste water flow into the lake and pollute it	
	YES	1
	NO	2
	Do you know that the Lake is becoming covered with the weed (Hyacinth) due to pollution	
	YES	1
	NO	2
	Do you think that rivers and canals around your neighbourhood are becoming polluted	
	YES	1
	NO	2
	Do you think that something has to be done to protect the lake from deterioration	
	YES	1
	NO	2
DO NOT KNOW	3	
Are you willing to contribute some money to protect the lake and rivers		
YES	1	
NO	2	
28	HOUSE TYPE	
	Permanent	1
	Semi-permanent	2
	Temporary	3
29	HOUSE OWNERSHIP	
	Tenant	1
	Own House	2
30	COST OF RENTING A HOUSE PER MONTH (KSHS)	
	0 - 500	1
	501 - 1000	2
	1001 - 1500	3
	1501 - 2000	4
	2001 - 2500	5
	2501 - 3000	6
	Over 3000	7
Not applicable	8	

Annex P2 Code Book

Variable	Description	Code
31	OWNERSHIP OF PROPERTY	
	Electricity	1
	Television	2
	Telephone	3
	Car/van	4
	Livestock (Cow, goat, chicken)	5
	Combination of either of the above	6
	Not applicable	7
32	COST OF ELECTRICITY PER MONTH (KSHS)	
	Less than 200	1
	200 - 500	2
	500 - 1000	3
	More than 1000	4
	Not applicable	5
33	RANGE OF MONTHLY EXPENCES (KSHS)	
	Less than 1000	1
	2500 - 5000	2
	5000 - 7500	3
	7500 - 10000	4
	Above 10000	5
34	ABILITY TO PAY AND WILLINGNESS TO PAY (KSHS)	
	If water supply and sewerage service is improved how much can you spend per month	
	Less than 50	1
	50 - 100	2
	100 - 200	3
	More than 200	4
35	IF WATER SUPPLY SERVICES IMPROVED HOW MUCH CAN YOU SPEND PER MONTH	
	Less than 50	1
	50 - 100	2
	100 - 200	3
	More than 200	4
36	IF WATER SUPPLY SERVICE IS PROVIDED WITHIN WALKING DISTANCE ARE YOU WILLING TO USE IT AND HOW MUCH CAN YOU SPEND PER MONTH	
	YES	1
	NO	2
37	AMOUNT TO BE PAID	
	Less than 50	1
	50 - 100	2
	100 - 200	3
	More than 200	4

ANNEX P3
DATA BOOK

	Sample
	Sex of respondent
	Family Members
	Water Source
	Drinking/Cooking
	Toilet
	Washing Clothes
	Cattle/Goats
	Garden
	Who Fetches Water
	Time Taken
	Approximate distance
	Time of fetching
	Payment/day/month
	Cost of 20lt jerrican
	Water collection
	Water quantity
	Water quality
	Water Price
	Mise Water
	Water Storage
	Wish to have house conn.
	Disposal of night soil/sewage
	Disposal of gray water
	Cost of disposal of Night soil/sewage
	Times of disposing is sludge
	Cost of disposing sludge
	Satisfaction of disposal of Night Soil/Sewage/sludge
	Improvements
	Disposal of garbage
	Experience of flooding/unsanitary conditions
	Frequency
	If yes is it severe
	Diseases
	Most Frequent Disease
	Cost of Medicine
	Boil Water
	Wash hands before
	Why Cholera occurs
	Cover food/water
	Fall sick when using impure water
	Fall sick if hands are not washed before meal/visit of toilets
	Pollution of lake due to untreated waste water
	Water from lake for drinking
	Pollution of lake due to waste water
	Covering of lake due pollution
	Pollution of river/canal's
	Protect lake/canal's/rivers
	Willingness to contribute money
	Type of house
	House Ownership
	Cost of rental House
	Ownership of property
	Cost of electricity
	Monthly Expenditure
	Ability/willingness to pay

	Sample
	Sex of respondent
	Family Members
	Water Source
	Drinking/Cooking
	Toilet
	Washing Clothes
	Cattle/Goats
	Garden
	Who Fetches Water
	Time Taken
	Approximate distance
	Time of fetching
	Payment/day/month
	Cost of 20lt. jerrican
	Water collection
	Water quantity
	Water quality
	Water Price
	Miss Water
	Water Storage
	Wish to have house conn
	Disposal of night soil/sewage
	Disposal of gray water
	Cost of disposal of Night soil/sewage
	Times of disposing is sludge
	Cost of disposing sludge
	Satisfaction of disposal of Night Soil/Sewage/sludge
	Improvements
	Disposal of garbage
	Experience of flooding/sanitary conditions
	Frequency
	If yes is it severe
	Diseases
	Most Frequent Disease
	Cost of Medicine
	Boil Water
	Wash hands before
	Why Cholera occurs
	Cover food/water
	Fall sick when using impure water
	Fall sick if hands are not washed before meal's/visit of toilets
	Pollution of lake due to untreated waste water
	Water from lake for drinking
	Pollution of lake due to waste water
	Covering of lake due pollution
	Pollution of river/canal's
	Protect lake/canal's/rivers
	Willingness to contribute money
	Type of house
	House Ownership
	Cost of rental House
	Ownership of property
	Cost of electricity
	Monthly Expenditure
	Ability/willingness to pay

	Sample
	Sex of respondent
	Family Members
	Water Source
	Drinking/Cooking
	Toilet
	Washing Clothes
	Cattle/Goats
	Garden
	Who Fetches Water
	Time Taken
	Approximate distance
	Time of fetching
	Payment/day/month
	Cost of 20lt. per can
	Water collection
	Water quantity
	Water quality
	Water Price
	Miss Water
	Water Storage
	Wish to have house conn
	Disposal of night soil/sewage
	Disposal of grey water
	Cost of disposal of Night soil/sewage
	Times of disposing is sludge
	Cost of disposing sludge
	Satisfaction of disposal of Night Soil/Sewage/sludge
	Improvements
	Disposal of garbage
	Experience of flooding/unsanitary conditions
	Frequency
	If yes is it severe
	Diseases
	Most Frequent Disease
	Cost of Medicine
	Soil Water
	Wash hands before
	Why Cholera occurs
	Cover food/water
	Fall sick when using impure water
	Fall sick if hands are not washed before meal/visit of toilets
	Pollution of lake due to untreated waste water
	Water from lake for drinking
	Pollution of lake due to waste water
	Covering of lake due pollution
	Pollution of rivers/canal's
	Protect lake/ canal's/rivers
	Willingness to contribute money
	Type of house
	House Ownership
	Cost of rental House
	Ownership of property
	Cost of electricity
	Monthly Expenditure
	Ability/willingness to pay

Database P2 - Public Attitude Survey - Water Supplied and Unsewered Area (Water Only)

28	Sample		
27	Sex of respondent		
26	Family Members		
25	Water Source		
24	Drinking/Cooking		
23	Toilet		
22	Washing Clothes		
21	Cattle/Goats		
20	Garden		
19	Who Fetches Water		
18	Time Taken		
17	Approximate distance		
16	Time of fetching		
15	Payment/day/month		
14	Cost of 20lt. jerrican		
13	Water collection		
12	Water quantity		
11	Water quality		
10	Water Price		
9	Miss Water		
8	Water Storage		
7	Wish to have house conn.		
6	Disposal of night soil/sewage		
5	Disposal of gray water		
4	Cost of disposal of Night soil/sewage		
3	Times of disposing is sludge		
2	Cost of disposing sludge		
1	Satisfaction of disposal of Night Soil/Sewage/sludge		
0	Improvements		
-1	Disposal of garbage		
-2	Experience of flooding/unsanitary conditions		
-3	Frequency		
-4	if yes is it severe		
-5	Diseases		
-6	Most Frequent Disease		
-7	Cost of Medicine		
-8	Boil Water		
-9	Wash hands before		
-10	Why Cholera occurs		
-11	Cover food/water		
-12	Fall sick when using impure water		
-13	Fall sick if hands are not washed before meals/visit of toilets		
-14	Pollution of lake due to untreated waste water		
-15	Water from lake for drinking		
-16	Pollution of lake due to waste water		
-17	Covering of lake due pollution		
-18	Pollution of the/canal/s		
-19	Protect lake/canal/s/overs		
-20	Willingness to contribute money		
-21	Type of house		
-22	House Ownership		
-23	Cost of rental House		
-24	Ownership of property		
-25	Cost of electricity		
-26	Monthly Expenditure		
-27	Ability/willingness to pay		

1	Sample
2	Sex of respondent
3	Family Members
4	Water Source
5	Drinking/Cooking
6	Toilet
7	Washing Clothes
8	Cattle/Goats
9	Garden
10	Who Fetches Water
11	Time Taken
12	Approximate distance
13	Time of fetching
14	Payment/day/month
15	Cost of 20L per can
16	Water collection
17	Water quantity
18	Water quality
19	Water Price
20	Max Water
21	Water Storage
22	Wash to have house clean
23	Disposal of night soil/sewage
24	Disposal of gray water
25	Cost of disposal of Night soil/sewage
26	Times of disposing of sludge
27	Cost of disposing sludge
28	Satisfaction of disposal of Night Soil/Sewage/sludge
29	Improvements
30	Disposal of garbage
31	Experience of flooding/sanitary conditions
32	Frequency
33	if yes is it severe
34	Diseases
35	Most Frequent Disease
36	Cost of Medicine
37	Boil Water
38	Wash hands before
39	Why Cholera occurs
40	Cover food/water
41	Fall sick when using impure water
42	Fall sick if hands are not washed before meals/visit of toilet
43	Pollution of lake due to untreated waste water
44	Water from lake for drinking
45	Pollution of lake due to waste water
46	Covering of lake due pollution
47	Pollution of river/canal
48	Protect lake/canal/rivers
49	Willingness to contribute money
50	Type of house
51	House Ownership
52	Cost of rental House
53	Ownership of property
54	Cost of electricity
55	Monthly Expenditure
56	Ability/willingness to pay

30	Sample
27	Sex of respondent
26	Family Members
25	Water Source
24	Drinking/Cooking
23	Toilet
22	Washing Clothes
21	Cattle/Goats
20	Garden
19	Who Fetches Water
18	Time Taken
17	Approximate distance
16	Time of fetching
15	Payment/day/month
14	Cost of 20lt. Jerican
13	Water collection
12	Water quantity
11	Water quality
10	Water Price
9	Miss Water
8	Water Storage
7	Wish to have house conn.
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5	Disposal of gray water
4	Cost of disposal of Night soil/sewage
3	Times of disposing ls sludge
2	Cost of disposing sludge
1	Satisfaction of disposal of Night Soil/Sewage/sludge
	Improvements
	Disposal of garbage
	Experience of flooding/unsanitary conditions
	Frequency
	If yes is it severe
	Diseases
	Most Frequent Disease
	Cost of Medicine
	Boil Water
	Wash hands before
	Why Cholera occurs
	Cover food/water
	Fall sick when using impure water
	Fall sick if hands are not washed before meals/visit of toilets
	Pollution of lake due to untreated waste water
	Water from lake for drinking
	Pollution of lake due to waste water
	Covering of lake due pollution
	Pollution of river/canals
	Protect lake/canal/ivers
	Willingness to contribute money
	Type of house
	House Ownership
	Cost of rental House
	Ownership of property
	Cost of electricity
	Monthly Expenditure
	Ability/Willingness to pay

2	Sample
3	Sex of respondent
4	Family Members
5	Water Source
6	Drinking/Cooking
7	Toilet
8	Washing Clothes
9	Cattle/Goats
10	Garden
11	Who Fetches Water
12	Time Taken
13	Approximate distance
14	Time of fetching
15	Payment/day/month
16	Cost of 20lt. jerrican
17	Water collection
18	Water quantity
19	Water quality
20	Water Price
21	Miss Water
22	Water Storage
23	Wish to have house conn
24	Disposal of night soil/sewage
25	Disposal of gray water
26	Cost of disposal of Night soil/sewage
27	Times of disposing is sludge
28	Cost of disposing sludge
29	Satisfaction of disposal of Night Soil/Sewage/sludge
30	Improvements
31	Disposal of garbage
32	Experience of flooding/sanitary conditions
33	Frequency
34	If yes is it severe
35	Diseases
36	Most Frequent Disease
37	Cost of Medicine
38	Boil Water
39	Wash hands before
40	Why Cholera occurs
41	Cover food/water
42	Fall sick when using impure water
43	Fall sick if hands are not washed before meals/visit of toilets
44	Pollution of lake due to untreated waste water
45	Water from lake for drinking
46	Pollution of lake due to waste water
47	Covering of lake due pollution
48	Pollution of river/canal/s
49	Protect lakes/canal/s rivers
50	Willingness to contribute money
51	Type of house
52	House Ownership
53	Cost of rental House
54	Ownership of property
55	Cost of electricity
56	Monthly Expenditure
57	Ability/Willingness to pay

APPENDIX-Q

**POPULATION SERVED AND
WATER DEMAND FOR
PHASE I PROJECT**

DAY AVERAGE AND MAXIMUM WATER DEMAND IN KIBUYE DISTRIBUTION ZONE

Sub-location		Population Served							Per Capita Consumption									
		Total	Distribution as per Service Level						House Connection				Water Kiosk					
			House Connection			Water Kiosk			High	Medium	Low	High	Medium	Low	High	Peri-Urban & Rural		
			High	Medium	Low	Urban	High	Medium								Low	High	High
Urban	Kibuye	37,211	6,409	12,197	15,505	3,101	0	0	0	200	120	60	20	-	-	-		
	Millimani	19,617	3,378	6,430	8,174	1,635	0	0	0	200	120	60	20	-	-	-		
	kanyakwar	23,823	4,103	7,809	9,926	1,985	0	0	0	200	120	60	20	-	-	-		
	Sub-total	80,651	13,890	26,436	33,605	6,721	0	0	0	-	-	-	-	-	-	-		
Peri-urban	Nyalenda	79,552	7,513	20,153	22,098	0	442	5,038	24,308	120	60	50	-	20	20	15		
	Manyatta	106,354	10,045	26,943	29,543	0	591	6,736	32,497	120	60	50	-	20	20	15		
	Kasule	34,409	3,250	8,717	9,558	0	191	2,179	10,514	120	60	50	-	20	20	15		
	Wathorego	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-		
	Korando	12,367	1,168	3,133	3,435	0	69	783	3,779	120	60	50	-	20	20	15		
	Kogony	16,212	1,531	4,107	4,503	0	90	1,027	4,954	120	60	50	-	20	20	15		
	Sub-total	248,894	23,507	63,053	69,137	0	1,383	15,763	76,052	-	-	-	-	-	-	-		
	Rural	Chiga	287	27	73	80	0	2	18	88	120	60	50	-	20	20	15	
Nyalunya	1,800	170	456	500	0	10	114	550	120	60	50	-	20	20	15			
Kadero	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-			
Okok	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-			
Konya	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-			
Sub-total	2,087	197	529	580	0	12	132	638	-	-	-	-	-	-	-			
Total		331,632	37,594	90,018	103,322	6,721	1,395	15,895	76,690	-	-	-	-	-	-	-		

Sub-location		Day Average Demand													Day Maximum Demand
		Domestic Water Demand								Non-domestic Water Demand				Total	
		House Connection			Water Kiosk				Sub-total	Institutional	Commercial	Industrial	Sub-total		
		High m3/day	Medium m3/day	Low m3/day	Urban	High m3/day	Medium m3/day	Low m3/day						m3/day	
Urban	Kibuye	1,281.8	1,463.6	930.3	62.0	0.0	0.0	0.0	3,737.8	545.0	1,371.0	5,510.0	7,426.0	11,163.8	17,345
	Millimani	675.6	771.6	490.4	32.7	0.0	0.0	0.0	1,970.3	287.0	723.0	0.0	1,010.0	2,980.3	4,630
	kanyakwar	820.6	937.1	595.6	39.7	0.0	0.0	0.0	2,392.9	349.0	878.0	0.0	1,227.0	3,619.9	5,624
	Sub-total	2,778.0	3,172.3	2,016.3	134.4	0.0	0.0	0.0	8,101.0	1,181.0	2,972.0	5,510.0	9,663.0	17,764.0	27,599
Peri-urban	Nyalenda	901.6	1,209.2	1,104.9	0.0	8.8	100.8	364.6	3,689.9	341.0	470.0	0.0	811.0	4,500.9	6,993
	Manyatta	1,205.4	1,616.6	1,477.2	0.0	11.8	134.7	487.5	4,933.1	456.0	628.0	0.0	1,084.0	6,017.1	9,349
	Kasule	390.0	523.0	477.9	0.0	3.8	43.6	157.7	1,596.0	148.0	203.0	416.0	767.0	2,363.0	3,671
	Wathorego	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Korando	140.2	188.0	171.8	0.0	1.4	15.7	56.7	573.6	53.2	72.8	356.4	482.4	1,056.0	1,641
	Kogony	183.7	246.4	225.2	0.0	1.8	20.5	74.3	751.9	69.5	95.5	386.0	551.0	1,302.9	2,024
Sub-total	2,820.8	3,783.2	3,456.9	0.0	27.7	315.3	1,140.8	11,544.6	1,067.7	1,469.3	1,158.4	3,695.4	15,240.0	23,678	
Rural	Chiga	3.2	4.4	4.0	0.0	0.0	0.4	1.3	13.3	1.0	2.0	119.0	122.0	135.3	210
	Nyalunya	20.4	27.4	25.0	0.0	0.2	2.3	8.3	83.5	8.0	11.0	772.0	791.0	874.5	1,359
	Kadero	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Okok	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Konya	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Sub-total	23.6	31.7	29.0	0.0	0.2	2.6	9.6	96.8	9.0	13.0	891.0	913.0	1,009.8	1,569	
Total		5,622.5	6,987.2	5,502.2	134.4	27.9	317.9	1,150.4	19,742.4	2,257.7	4,454.3	7,559.4	14,271.4	34,013.8	52,846

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DAY AVERAGE AND MAXIMUM WATER DEMAND IN KANYAKWAR DISTRIBUTION ZONE

Sub-location		Population Served								Per Capita Consumption							
		Total	Distribution as per Service Level							Distribution as per Service Level							
			House Connection			Water Kiosk				House Connection			Water Kiosk				
			High	Medium	Low	Urban	Peri-Urban & Rural			High	Medium	Low	Urban	Peri-Urban & Rural			
High	High	Medium					Low	High	High					Medium	Low		
Urban	Kibuye	0	0	0	0	0	0	0	0					-	-	-	
	Millimani	0	0	0	0	0	0	0	0					-	-	-	
	kanyakwar	23,823	4,103	7,809	9,926	1,985	0	0	0	200	120	60	20	-	-	-	
	Sub-total	23,823	4,103	7,809	9,926	1,985	0	0	0	-	-	-	-	-	-	-	
Peri-urban	Nyalenda	0	0	0	0	0	0	0	0					-	-	-	
	Manvatta	0	0	0	0	0	0	0	0					-	-	-	
	Kasule	0	0	0	0	0	0	0	0					-	-	-	
	Wathorego	9188	868	2,328	2,552	0	51	582	2,807	120	60	50	-	20	20	15	
	Korando	0	0	0	0	0	0	0	0					-	-	-	
	Kogony	0	0	0	0	0	0	0	0					-	-	-	
	Sub-total	9188	868	2,328	2,552	0	51	582	2,807	-	-	-	-	-	-	-	
Rural	Chiga	0	0	0	0	0	0	0	0					-	-	-	
	Nyalunya	0	0	0	0	0	0	0	0					-	-	-	
	Kadero	0	0	0	0	0	0	0	0					-	-	-	
	Okok	0	0	0	0	0	0	0	0					-	-	-	
	Konya	0	0	0	0	0	0	0	0					-	-	-	
	Sub-total	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	
Total		33,011	4,971	10,137	12,478	1,985	51	582	2,807	-	-	-	-	-	-	-	

Sub-location		Day Average Demand												Day Maximum Demand m3/day		
		Domestic Water Demand								Sub-total m3/day	Non-domestic Water Demand				Total m3/day	
		House Connection			Water Kiosk						Institutional m3/day	Commercial m3/day	Industrial m3/day			
		High m3/day	Medium m3/day	Low m3/day	Urban m3/day	Peri-Urban & Rural										
			High m3/day	High m3/day	Medium m3/day	Low m3/day										
Urban	Kibuye	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Millimani	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	kanyakwar	820.6	937.1	595.6	39.7	0.0	0.0	0.0	0.0	2,392.9	349.0	878.0	0.0	1,227.0	3,619.9	5,624
	Sub-total	820.6	937.1	595.6	39.7	0.0	0.0	0.0	0.0	2,392.9	349.0	878.0	0.0	1,227.0	3,619.9	5,624
Peri-urban	Nyalenda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Manvatta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Kasule	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Wathorego	104.2	139.7	127.6	0.0	1.0	11.6	42.1	426.2	39.7	54.0	0.0	0.0	93.7	519.9	808
	Korando	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Kogony	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Sub-total	104.2	139.7	127.6	0.0	1.0	11.6	42.1	426.2	39.7	54.0	0.0	0.0	93.7	519.9	808
Rural	Chiga	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Nyalunya	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Kadero	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Okok	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Konya	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Sub-total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Total		924.8	1,076.8	723.2	39.7	1.0	11.6	42.1	2,819.1	388.7	932.0	0.0	1,320.7	4,139.8	6,432	

DAY AVERAGE AND MAXIMUM WATER DEMAND IN KOGONY DISTRIBUTION ZONE

Sub-location		Population Served								Per Capita Consumption							
		Total	Distribution as per Service Level							Distribution as per Service Level							
			House Connection			Water Kiosk				House Connection			Water Kiosk				
			High	Medium	Low	Urban		Peri-Urban & Rural		High	Medium	Low	Urban		Peri-Urban & Rural		
High	High	Medium				Low	High	High	Medium				Low				
Urban	Kibuye	0	0	0	0	0	0	0	0					-	-	-	
	Millimani	0	0	0	0	0	0	0	0					-	-	-	
	kanyakwar	0	0	0	0	0	0	0	0					-	-	-	
	Sub-total	0	0	0	0	0	0	0	0					-	-	-	
Peri-urban	Nvalenda	0	0	0	0	0	0	0	0					-	-	-	
	Manyatta	0	0	0	0	0	0	0	0					-	-	-	
	Kasule	0	0	0	0	0	0	0	0					-	-	-	
	Wathorego	0	0	0	0	0	0	0	0					-	-	-	
	Korando	18550	1,752	4,699	5,153	0	103	1,175	5,668	120	60	50	-	-	20	20	15
	Kogony	16212	1,531	4,107	4,503	0	90	1,027	4,954	120	60	50	-	-	20	20	15
	Sub-total	34762	3,283	8,806	9,656	0	193	2,202	10,622	-	-	-	-	-	-	-	-
Rural	Chiga	0	0	0	0	0	0	0	0					-	-	-	
	Nvalunya	0	0	0	0	0	0	0	0					-	-	-	
	Kadero	0	0	0	0	0	0	0	0					-	-	-	
	Okok	0	0	0	0	0	0	0	0					-	-	-	
	Konya	0	0	0	0	0	0	0	0					-	-	-	
	Sub-total	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-
Total		34,762	3,283	8,806	9,656	0	193	2,202	10,622	-	-	-	-	-	-	-	-

Sub-location		Day Average Demand													Day Maximum Demand m3/day		
		Domestic Water Demand								Sub-total m3/day	Non-domestic Water Demand					Total m3/day	
		House Connection			Water Kiosk				Institutional m3/day		Commercial m3/day	Industrial m3/day	Sub-total m3/day				
		High m3/day	Medium m3/day	Low m3/day	Urban		Peri-Urban & Rural										
High m3/day	High m3/day				Medium m3/day	Low m3/day											
Urban	Kibuye	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Millimani	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	kanyakwar	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Sub-total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Peri-urban	Nvalenda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Manyatta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Kasule	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Wathorego	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Korando	210.2	281.9	257.7	0.0	2.1	23.5	85.0	860.4	79.8	109.2	534.6	723.6	1,584.0	2,461	2,024	0
	Kogony	183.7	246.4	225.2	0.0	1.8	20.5	74.3	751.9	69.5	95.5	386.0	551.0	1,302.9	2,024	4,485	0
	Sub-total	394.0	528.4	482.8	0.0	3.9	44.0	159.3	1,612.4	149.3	204.7	920.6	1,274.6	2,887.0	4,485	0	0
Rural	Chiga	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Nvalunya	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Kadero	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Okok	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Konya	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	Sub-total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Total		394.0	528.4	482.8	0.0	3.9	44.0	159.3	1,612.4	149.3	204.7	920.6	1,274.6	2,887.0	4,485	0	0

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DAY AVERAGE AND MAXIMUM WATER DEMAND IN KAJULE DISTRIBUTION ZONE

Sub-location	Population Served									Per Capita Consumption						
	Total	Distribution as per Service Level								Distribution as per Service Level						
		House Connection			Water Kiosk					House Connection			Water Kiosk			
		High	Medium	Low	Urban	Peri-Urban & Rural				High	Medium	Low	Urban	Peri-Urban & Rural		
				High	High	Medium	Low					High	High	Medium	Low	
Urban	Kibuye	0	0	0	0	0	0	0	0							
	Millimani	0	0	0	0	0	0	0	0							
	kanyakwar	0	0	0	0	0	0	0	0							
	Sub-total	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-
Peri-urban	Nyalenda	0	0	0	0	0	0	0	0							
	Manvatta	0	0	0	0	0	0	0	0							
	Kasule	0	0	0	0	0	0	0	0							
	Wathorego	4947	467	1,253	1,374	0	27	313	1,512	120	60	50	-	20	20	15
	Korando	0	0	0	0	0	0	0	0							
	Kogony	0	0	0	0	0	0	0	0							
	Sub-total	4947	467	1,253	1,374	0	27	313	1,512	-	-	-	-	-	-	-
Rural	Chiga	0	0	0	0	0	0	0	0							
	Nvalunya	0	0	0	0	0	0	0	0							
	Kadero	1610	152	408	447	0	9	102	492	120	60	50	-	20	20	15
	Okok	683	65	173	190	0	4	43	209	120	60	50	-	20	20	15
	Konva	7888	745	1,998	2,191	0	44	500	2,410	120	60	50	-	20	20	15
		Sub-total	10181	962	2,579	2,828	0	57	645	3,111	-	-	-	-	-	-
	Total	15,128	1,429	3,832	4,202	0	84	958	4,623	-	-	-	-	-	-	-

Sub-location	Day Average Demand														Day Maximum Demand
	Domestic Water Demand								Sub-total	Non-domestic Water Demand			Total		
	House Connection			Water Kiosk						Institutional	Commercial	Industrial			
	High	Medium	Low	Urban	Peri-Urban & Rural										
m3/day	m3/day	m3/day	High	High	Medium	Low	m3/day	m3/day	m3/day	m3/day	m3/day	m3/day	m3/day		
Urban	Kibuye	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Millimani	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	kanyakwar	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sub-total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Peri-urban	Nyalenda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Manvatta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Kasule	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Wathorego	56.0	75.2	68.7	0.0	0.5	6.3	22.7	229.4	21.4	29.1	0.0	50.5	279.9	435
	Korando	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Kogony	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sub-total	56.0	75.2	68.7	0.0	0.5	6.3	22.7	229.4	21.4	29.1	0.0	50.5	279.9	435
Rural	Chiga	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nvalunya	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Kadero	18.2	24.5	22.4	0.0	0.2	2.0	7.4	74.7	7.0	10.0	0.0	17.0	91.7	142
	Okok	7.8	10.4	9.5	0.0	0.1	0.9	3.1	31.8	3.0	4.0	0.0	7.0	38.8	60
	Konva	89.4	119.9	109.6	0.0	0.9	10.0	36.2	365.9	33.0	46.0	0.0	79.0	444.9	691
		Sub-total	115.4	154.7	141.4	0.0	1.1	12.9	46.7	472.3	43.0	60.0	0.0	103.0	575.3
	Total	171.5	229.9	210.1	0.0	1.7	19.2	69.3	701.7	64.4	89.1	0.0	153.5	855.2	1,329

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TOTAL DAY AVERAGE AND MAXIMUM WATER DEMAND

Sub-location		Population Served								Per Capita Consumption							
		Total	Distribution as per Service Level							Distribution as per Service Level							
			House Connection			Water Kiosk				House Connection			Water Kiosk				
			High	Medium	Low	Urban		Peri-Urban & Rural		High	Medium	Low	Urban		Peri-Urban & Rural		
High	High	Medium				Low	High	High	Medium				Low				
Urban	Kibuye	37,211	6,409	12,197	15,505	3,101	0	0	0	200	120	60	20	-	-	-	
	Millimani	19,617	3,378	6,430	8,174	1,635	0	0	0	200	120	60	20	-	-	-	
	Kanyakwar	47,645	8,206	15,618	19,852	3,970	0	0	0	200	120	60	20	-	-	-	
	Sub-total	104,473	17,993	34,245	43,531	8,706	0	0	0	-	-	-	-	-	-	-	
Peri-urban	Nyalenda	79,552	7,513	20,153	22,098	0	442	5,038	24,308	120	60	50	-	20	20	15	
	Manyatta	106,354	10,045	26,943	29,543	0	591	6,736	32,497	120	60	50	-	20	20	15	
	Kasule	34,409	3,250	8,717	9,558	0	191	2,179	10,514	120	60	50	-	20	20	15	
	Wathorego	14,135	1,335	3,581	3,926	0	78	895	4,319	120	60	50	-	20	20	15	
	Korando	30,917	2,920	7,832	8,588	0	172	1,958	9,447	120	60	50	-	20	20	15	
	Kogony	32,423	3,062	8,214	9,006	0	180	2,054	9,908	120	60	50	-	20	20	15	
	Sub-total	297,790	28,125	75,440	82,719	0	1,654	18,860	90,993	-	-	-	-	-	-	-	
Rural	Chiga	287	27	73	80	0	2	18	88	120	60	50	-	20	20	15	
	Nyalunya	1,800	170	456	500	0	10	114	550	120	60	50	-	20	20	15	
	Kadero	1,610	152	408	447	0	9	102	492	120	60	50	-	20	20	15	
	Okok	683	65	173	190	0	4	43	209	120	60	50	-	20	20	15	
	Konya	7,888	745	1,998	2,191	0	44	500	2,410	120	60	50	-	20	20	15	
	Sub-total	12,268	1,159	3,108	3,408	0	69	777	3,749	-	-	-	-	-	-	-	
Total		414,531	47,277	112,793	129,658	8,706	1,723	19,637	94,742	-	-	-	-	-	-	-	

Sub-location		Day Average Demand													Day Maximum Demand m3/day
		Domestic Water Demand								Sub-total m3/day	Non-domestic Water Demand			Total m3/day	
		House Connection			Water Kiosk				Institutional m3/day		Commercial m3/day	Industrial m3/day	Sub-total m3/day		
		High m3/day	Medium m3/day	Low m3/day	Urban m3/day	Peri-Urban & Rural		Low m3/day							
High m3/day	High m3/day					Medium m3/day	Low m3/day								
Urban	Kibuye	1,282	1,464	930	62	0	0	0	3,738	545	1,371	5,510	7,426	11,163.8	17,345
	Millimani	676	772	490	33	0	0	0	1,970	287	723	0	1,010	2,980.3	4,630
	Kanyakwar	1,641	1,874	1,191	79	0	0	0	4,786	698	1,756	0	2,454	7,239.9	11,248
	Sub-total	3,599	4,109	2,612	174	0	0	0	10,494	1,530	3,850	5,510	10,890	21,384.0	33,224
Peri-urban	Nyalenda	902	1,209	1,105	0	9	101	365	3,690	341	470	0	811	4,500.9	6,993
	Manyatta	1,205	1,617	1,477	0	12	135	487	4,933	456	628	0	1,084	6,017.1	9,349
	Kasule	390	523	478	0	4	44	158	1,596	148	203	416	767	2,363.0	3,671
	Wathorego	160	215	196	0	2	18	65	656	61	83	0	144	799.8	1,243
	Korando	350	470	429	0	3	39	142	1,434	133	182	891	1,206	2,640.0	4,102
	Kogony	367	493	450	0	4	41	149	1,504	139	191	772	1,102	2,605.9	4,049
	Sub-total	3,375	4,526	4,136	0	33	377	1,365	13,813	1,278	1,757	2,079	5,114	18,926.7	29,406
Rural	Chiga	3	4	4	0	0	0	1	13	1	2	119	122	135.3	210
	Nyalunya	20	27	25	0	0	2	8	83	8	11	772	791	874.5	1,359
	Kadero	18	24	22	0	0	2	7	75	7	10	0	17	91.7	142
	Okok	8	10	10	0	0	1	3	32	3	4	0	7	38.8	60
	Konya	89	120	110	0	1	10	36	366	33	46	0	79	444.9	691
	Sub-total	139	186	170	0	1	16	56	569	52	73	891	1,016	1,585.1	2,463
Total		7,113	8,822	6,918	174	34	393	1,421	24,876	2,860	5,680	8,480	17,020	41,895.8	65,092

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APPENDIX-R

**COST ESTIMATES FOR
PHASE I PROJECT**

Estimated Costs for Phase I of Master Plan on Municipal Water Supply System

Proposed Facilities		Remarks	Cost 1000US\$
I Intake Facilities			3,052
I-a	Kibos River (Kajulu)	Rehabilt.	70
I-b	Lake Victoria	Rehabilt.	1,162
I-c	Kibos/Awach River	Phase I	1,820
II Raw Water Pump Station			560
II-a	Lake Intake	Rehabilt.	560
III Raw Water Transmission Pipeline			7,543
III-a	Kajulu I. - Kajulu W.W	Rehabilt.	-
III-b	Lake I. - Lake W.W	Rehabilt.	99
III-c	Kibos/Awach I - Kibuye W.W	Phase I	7,444
IV Treatment Works			14,317
IV-a	Kajulu Water Treatment Works	Rehabilt.	552
IV-b	Kibuye Water Treatment Works	Phase I	10,741
IV-d	Lake Water Treatment Works	Rehabilt.	3,024
V Treated Water Pump Station			1,980
V-a	at Lake Water Treatment Works	Rehabilt.	893
V-b	at Kibuye Reservoir	Rehabilt.	305
V-c	to Kogony	Phase I	391
V-e	to Kanyakwar	Phase I	391
VI Treated Water Transmission Pipeline			3,194
VI-a	Kajulu W.W. - Kajulu Reservoir	Rehabilt.	153
VI-b	Lake W.W - Kibuye Reservoir	Rehabilt.	1,064
VI-c	Kibuye Reservoir - Kogony Reservoir	Phase I	1,259
VI-d	Kibuye Reservoir - Kanyakwar Reservoir	Phase I	718
VII Reservoirs			1,948
VII-a	Kajulu Reservoir	Rehabilt.	70
VII-b	Kibuye Reservoir	Phase I	1,190
VII-d	Kogony Reservoir	Phase I	300
VII-f	Kanyakwar Reservoir	Phase I	388
VIII Trunk Mains (Pipe diameter 150mm and larger)			8,914
VIII-a		Phase I	8,914
IX Service Mains (Pipe diameter smaller than 150 mm)			5,022
IX-a		Phase I	5,022
Total			46,530
			Rehabilitation
			7,952
			Phase I
			38,578

*: including 1 standby pump
reh.: Rehabilitation

exp.: Expansion
W.W: Water Treatment Works

Yen (x 1,000)	Total	5,816,250
	Rehabilt.	994,000
1 US\$ = 125	Phase I	4,822,250

**COST BREAKDOWN FOR WATER SUPPLY SYSTEM
REHABILITATION COMPONENTS**

Item No.	Description	Total Amount US\$	Supply Contract RW-S1 US\$	Civil Contract		
				Total Amount US\$	Kajule RW-C1 US\$	Lake RW-C2 US\$
I	Intake Facility					
	Kibos River Intake	70,000	56,000	14,000	14,000	
	Lake Victoria Intake	1,162,000	661,500	500,500		500,500
II	Raw Water Pump Station					
	Lake Intake Pump Station	560,000		560,000		560,000
	Raw Water Mains from Lake Intake to Lake Water Treatment Works	99,120	86,234	12,886		12,886
III	Water Treatment Works					
	Kajulu Water Treatment Works	552,300	381,226	171,074	171,074	
	Lake Water Treatment Works	3,023,524	1,783,614	1,239,910		1,239,910
IV	Treated Water Pump Station					
	Lake Water Treatment Works	893,200		893,200		893,200
	Kibuye Reservoir	305,200		305,200		305,200
V	Treated Water Transmission Pipeline					
	Treated Water Mains from Kajulu Water Treatment Works to Kajulu Reservoir	152,880	120,775	32,105	32,105	
	Treated Water Mains from Lake Water Treatment Works to Kibuye Reservoir	1,064,000	925,680	138,320		138,320
VI	Kajulu Reservoir	70,000	14,000	56,000	56,000	
Total Amount		7,952,000	4,029,000	3,923,000	273,000	3,650,000

Water Supply : Rehabilitation Component

Item No.	Description	Unit	Qty.	Rate	Amount
				US \$	US \$
i	Intake Facility				
	Kibos River Intake (Rehabilitation)				
	Supply all materials and raise the weir wall of the existing intake works, including intake / outlet chamber, screen, scour and outlet valves.	sum	-	70,000	70,000
					70,000
	Lake Victoria Intake (Rehabilitation)				
	(1) Provide all materials and construct retaining wall surrounding the existing intake works to solve the problem of Water Hyacinth and its roots clogging the existing foot-valves and strainers including screens and supporting fixtures.	sum	-	280,000	280,000
	(2) Refurbish both the existing intake chambers, including new screens, penstock and diversion channels etc.	sum	-	84,000	84,000
	(3) Replace all the existing valves at both the old intake and new intake including pipework and fittings.	sum	-	157,500	157,500
	(4) Refurbish the pump house, chambers, build a new pump house over new Intake pumps including all civil works.	sum	-	108,500	108,500
	(5) Supply all materials, pipework and fittings and replace the existing 225 mm dia. bulk flow meters, intake pipes, foot-valves and strainers, including modifications of the new raw water main to Lake Treatment Works.	sum	-	280,000	280,000
	(6) Refurbish all the existing staff houses, including repairs and/or replacement of damaged fencing, gates, access road, security and street lighting including provision of radio call system between Intake Works, Treatment Works and Town Hall.	sum	-	210,000	210,000
	(7) Supply and install 350 KW stand-by diesel generator including all associated work and Generator House	sum	-	42,000	42,000
					1,162,000
ii	Raw Water Pump Station				
	Lake Intake Pump Station (Rehabilitation)				
	Supply all materials and construct a new Pump House to accommodate all new raw water pumps, control panels, pipework and fittings.	sum	-	560,000	560,000
				560,000	
	Raw Water Mains from Lake Intake to Lake Water Treatment Works (Rehabilitation)				
Supply and lay 450 mm dia. steel raw water pipe	m	600	165	99,120	
				99,120	
iii	Water Treatment Works				
	Kajulu Water Treatment Works (Rehabilitation)				
	(1) Supply and lay 200 mm dia. steel pipe from existing intake to the mixing / dosing chamber, approximately 300 metres long including valves and fittings	m	300	59	17,640
(2) Modify the existing mixing / dosing					

Water Supply : Rehabilitation Component

Item No.	Description	Unit	Qty.	Rate		Amount	
				US \$	US \$	US \$	US \$
(3)	Chamber to receive addition water of upto 2800 m ³ /day Supply all materials and construct an additional R.C. flocculation tank including all inter-connecting pipes, valves and all civil works.	lump sum	-	13,090		13,090	
		lump sum	-	26,530		26,530	
(4)	Supply all materials and construct an additional reinforced concrete sedimentation tank including all inter-connecting pipes, valves and all civil works.	lump sum	-	102,760		102,760	
		lump sum	-	84,000		84,000	
(5)	Supply and install 6 No. G.R.P. mixing and dosing tanks of 3 m ³ capacity each, including FRN gravity dosers, all uPVC dosing pipework valves and fittings for Alum, Soda Ash and Chlorine dosing	lump sum	-	308,280		308,280	
		lump sum	-				552,300
Lake Water Treatment Works (Rehabilitation)							
NEW TREATMENT WORKS (REFURBISHMENT)							
(1)	Supply and install 6 No. G.R.P. mixing / dosing tanks of 4 m ³ capacity at the main inlet to the Treatment Works splitter box including FRN gravity dosers, all uPVC pipework, valves and fittings for Alum, Soda and Chlorine dosing	sum	-	13,720		13,720	
		sum	-	11,200		11,200	
(2)	Replace the existing two booster pumps which transfer chemicals from mixing tanks to dosing tanks rated at 0.2 l/sec @ 16 m head including all electrical work and control panels.	sum	-	3,080		3,080	
		sum	-	210,770		210,770	
(3)	Replace the existing 300 mm dia and 250 mm dia double flanged sluice valves on the inlet mains to Lake Treatment Works including flange adaptors	sum	-	80,290		80,290	
		sum	-	700		700	
(4)	Supply and install complete sets of G.R.P. lamella plates at all the existing sedimentation tanks including all fittings and fixtures in aluminium.	sum	-	1,190		1,190	
		sum	-	4,200		4,200	
(5)	Remove all the existing filter media from four rapid gravity filters, check and replace as necessary all the air scour, and backwash pipes, under-drains, nozzles, install new filter gravel and sand as specified.	sum	-	80,290		80,290	
		sum	-	700		700	
(6)	Supply and install 200 mm dia flow control valve at the back-wash main to the filters	sum	-	1,190		1,190	
		sum	-	700		700	
(7)	Supply and replace the existing 2 No. 150 mm dia. de-sludging valves and 3 No. 50 mm dia bleeder valves at the New Sedimentation tanks	sum	-	4,200		4,200	
		sum	-	80,290		80,290	
OLD TREATMENT WORKS (REFURBISHMENT)							
(8)	Supply and install a new dispersion cone in one sedimentation tank at Old Treatment Works	sum	-	700		700	
		sum	-	80,290		80,290	
(9)	Remove all the existing filter media from four rapid gravity filters, check and replace as necessary all the air scour, and backwash pipes, under-drains, nozzles, install new filter gravel and sand as specified	sum	-	700		700	
		sum	-	700		700	
(10)	Supply and install 200 mm dia flow control valve at the back-wash main to the filters	sum	-	700		700	
		sum	-	700		700	
(11)	Supply and replace the existing	sum	-				
		sum	-				

Water Supply : Rehabilitation Component

Item No.	Description	Unit	Qty.	Rate	Amount
				US \$	US \$
(12)	4 No. - 100 mm dia. de-sludging valves and 4 No. - 50 mm dia. bleeder valves at Old Sedimentation Tanks	sum	-	1,414	1,414
	Supply and replace the following existing valves -				
	- 8 No. 200 mm dia. backwash inlet and backwash drainage valves.	sum	-	5,670	5,670
	- 4 No. - 150 mm dia. Clear Water inlet valves.	sum	-	1,750	1,750
(13)	- 4 No. 100 mm dia. Clear water outlet valves.	sum	-	980	980
	Supply and install a new stand-by Air-blower rated at 0.6 bars pressure and electric motor capacity of 10 H.P.	sum	-	32,200	32,200
VERY OLD TREATMENT WORKS (REFURBISHMENT)					
(14)	Remove all the existing filter media from four rapid gravity filters, check and replace as necessary all the air scour, and backwash pipes, under-drains, nozzles, install new filter gravel and sand as specified.	sum	-	80,290	80,290
(15)	Supply and install 200 mm dia flow control valve at the backwash main to the filters.	sum	-	700	700
(16)	Supply and replace the following existing valves -				
	- 8 No. - 200 mm dia. filter drain and backwash valves.	sum	-	5,600	5,600
	- 4 No. - 150 mm dia. clear water outlet valves.	sum	-	1,750	1,750
	- 4 No. - 150 mm dia. filter inlet vertical stop valves.	sum	-	1,750	1,750
(17)	Supply and replace 8 No. pressure gauges at the filter mains rated upto 25 bars.	sum	-	350	350
ELEVATED BACKWASH TANK					
(18)	Clean all elevated structural steel work including steel panels of 200 m3 elevated backwash tank and provide two coats of approved paint including corrosion protection to all steel work	sum	-	8,400	8,400
STORAGE RESERVOIRS					
(19)	Supply and install two level indicator gauges at the existing storage reservoirs.	sum	-	4,200	4,200
(20)	Supply and install 16 No. - 150 mm dia. G.S. roof ventilators at the storage reservoirs.	sum	-	5,600	5,600
OLD HIGH LIFT PUMP HOUSE					
(21)	Supply and replace all the existing six pumps and motors at the old high lift pump house. All six pumps rated at 24 l/sec at 90 metres head, including all electrical work, control panels, starters etc.	sum	-	112,000	112,000
(22)	Supply and replace all the existing 12 No. - 150 mm dia. valves on the delivery and suction mains of the pump.	sum	-	5,180	5,180
(23)	Supply and replace all the existing 6 No. - 150 mm dia non-return valves on the delivery mains	sum	-	2,590	2,590
(24)	Supply and replace the existing 225 mm dia. bulk flow meter at the outlet from Old High Lift Pumphouse.	sum	-	6,720	6,720
NEW HIGH LIFT PUMPHOUSE					
(25)	Supply and replace all the existing eight pumps and motors				

Water Supply : Rehabilitation Component

Item No.	Description	Unit	Qty.	Rate	Amount
				US \$	US \$
	at the old high lift pumphouse All eight pumps rated at 36 l/sec at 90 metres head, including all electrical work, control panels, starters etc.	sum	-	154,000	154,000
(26)	Supply and replace all the existing 8 No. - 150 mm dia. valves on the delivery and suction mains of the pump.	sum	-	3,500	3,500
(27)	Supply and replace all the existing 8 No. - 150 mm dia non-return valves on the delivery mains.	sum	-	3,640	3,640
(28)	Supply and replace the existing 300 mm dia bulk flow meter at the outlet from Old High Lift Pumphouse	sum	-	6,720	6,720
	CHEMICAL BUILDING				
(29)	Supply and install new gantry crane of 3.5 tonnes lifting capacity in the chemical store.	sum	-	25,200	25,200
(30)	Replace all electrical wiring, fittings and fixtures in the Chemical Building and store.	sum	-	12,600	12,600
(31)	Replace all door and windows including frames, locks, latches, handles etc. at the Chemical Building and store.	sum	-	8,400	8,400
	SITE WORKS				
(32)	Repair and/or replace all damaged fencing and main gate at the Treatment Works.	sum	-	11,200	11,200
(33)	Repair and/or replace all street lighting and the security lights at all process units of the Water Treatment Works.	sum	-	7,700	7,700
(34)	Supply and install two- way radio call system between the Town Hall, Lake Treatment Works and Kibuye Water Treatment Works.	sum	-	29,400	29,400
(35)	Refurbish and repair/paint all staff houses as necessary including repairs/replacement of damaged doors/windows, fittings and fixtures	sum	-	11,200	11,200
	NEW SEDIMENTATION TANKS				
(36)	Supply all materials and construct three new sedimentation tanks similar to the existing ones at New Treatment Works including all pipework, valves, fittings, inter- connections and civil works.	nr	3	115,080	345,240
	NEW FILTERS				
(37)	Supply all materials and construct four new Rapid Gravity Filters similar to the existing ones at the New Treatment Works including all pipework, valves, fittings, fittings, inter-connections, civil works, filter media, control valves, backwash pipework and laterals etc.	nr	4	97,660	391,440
	NEW HIGH LIFT PUMPHOUSE & PUMPS				
(38)	Supply all materials and construct new High Lift Pumphouse with 20 m x 6 m floor area including all civil works, pump plinths,				

Water Supply : Rehabilitation Component

Item No.	Description	Unit	Qty.	Rate	Amount
				US \$	US \$
(39)	drainage, pipework, valves and fittings.	sum	-	210,000	210,000
	Supply and install 4 No. centrifugal pumps (3 duty, 1 standby) rated at 96 l/sec at 90 m head	nr	4	210,000	840,000
(40)	Supply all materials and construct new access road to New Pump-House, relocate the existing transformer all inter-connecting pipework and bulk meter chamber.	sum	-	280,000	280,000
					3,023,524
IV	Treated Water Pump Station				
	Lake Water Treatment Works (Rehabilitation) Supply all materials and construct a new Pump House to accommodate all new raw water pumps, control panels, pipework and fittings.	sum	-	893,200	893,200
					893,200
	Kibuye Reservoir (Rehabilitation) Supply all materials and construct a new Pump House to accommodate all new raw water pumps, control panels, pipework and fittings.	sum	-	305,200	305,200
					305,200
V	Treated Water Transmission Pipeline				
	Treated Water Mains from Kajulu Water Treatment Works to Kajulu Reservoir (Rehabilitation) Supply and lay 200 mm dia. steel raw water pipe	m	2,600	59	152,880
					152,880
	Treated Water Mains from Lake Water Treatment Works to Kibuye Reservoir (Rehabilitation) Supply and lay 550 mm dia. steel raw water pipe	m	5,000	213	1,064,000
					1,064,000
VI	Kajulu Reservoir (Rehabilitation) Supply all materials and construct reinforced concrete twin compartment water storage reservoir of 700 m ³ capacity including all pipework, valves, fittings, chambers, interconnection pipework, drainage and all civil works for Rehabilitation.	sum	-	70,000	70,000
					70,000

**COST BREAKDOWN FOR WATER SUPPLY SYSTEM
EXPANSION COMPONENT**

Item No.	Description	Total Amount US \$	Supply Contract EW-S1 US \$	Civil Contract									
				Total Amount US \$	EW-C1 US \$	EW-C2 US \$	EW-C3 US \$	EW-C4 US \$	EW-C5 US \$	EW-C6 US \$	EW-C7 US \$	EW-C8 US \$	
I	Intake Facility	1,820,000	140,000	1,680,000	1,680,000								
	Kibos/Awach River Intake	7,443,500		7,443,500		7,443,500							
	Raw Water Mains from Kibos/Awach Intake to Kibuye Water Treatment Works												
II	Water Treatment Works	10,741,000	5,250,000	5,491,000		5,491,000							
	Kibuye Water Treatment Works												
III	Pump Stations	391,300	105,000	286,300				286,300					
	Kibuye Reservoir for Kogony Reservoir	391,300	105,000	286,300				286,300					
	Kibuye Reservoir for Kanyakwar Reservoir												
IV	Treated Water Transmission Pipeline	1,258,600		1,258,600						1,258,600			
	Treated Water Mains from Kibuye Reservoir to Kogony Reservoir	718,200		718,200					718,200				
	Treated Water Mains from Kibuye Reservoir to Kanyakwar Reservoir												
V	Reservoirs	1,190,000	322,000	868,000				868,000					
	Kibuye Reservoir	300,000	70,000	230,000						230,000			
	Kogony Reservoir	388,000	84,000	304,000					304,000				
	Kanyakwar Reservoir												
VI	Trunk Main	8,913,625		8,913,625							8,913,625		
	Trunk Main												
VII	Service Main	5,022,000		5,022,000									5,022,000
	Service Main												
	Total Amount	38,577,525	6,076,000	32,501,525	1,680,000	7,443,500	5,491,000	1,440,600	1,022,200	1,488,600	8,913,625	5,022,000	

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Water Supply : Expansion Component

Item No.	Description	Unit	Qty.	Rate	Amount
				US \$	US \$
I	Intake Facility				
	Kibos/Awach River Intake (Phase I)				
(1)	Supply all materials and construct an intake weir across the Kibos and Awach Rivers including intake and outlet chambers, screen, scour and outlet valves and fittings.	nr	2	420,000	840,000
(2)	Supply all materials and construct coffer dams to divert water in both rivers during construction period.	nr	2	280,000	560,000
(3)	Supply all materials and construct all civil works, access road, landscaping, rock blasting, transport of materials and equipment at Intake Works site	nr	2	210,000	420,000
					1,820,000
	Raw Water Mains from Kibos/Awach Intake to Kibuye Water Treatment Works (Phase I)				
	Supply and lay 700 mm dia. steel raw water pipe	m	6,900	414	2,856,600
	Supply and lay 400 mm dia. steel raw water pipe	m	6,000	203	1,218,000
	Supply and lay 900 mm dia. steel raw water pipe	m	5,900	571	3,368,900
					7,443,500
II	Water Treatment Works				
	Kibuye Water Treatment Works (Phase I)				
(1)	Supply all materials, equipment, pipes and fittings etc. and construct a complete new Water Treatment Works consisting of Mixing/Dosing Chamber, Flocculation and Sedimentation Basins, Rapid Gravity Filters, of 40,000 m ³ /day capacity in Phase I.	sum	-	8,540,000	8,540,000
(2)	Supply all materials and construct Administration Building and office block including W.C.'s.	sum	-	560,000	560,000
(3)	Supply all materials and construct Chemical Building and Chemical Storage area including all dosing equipment and plant.	sum	-	840,000	840,000
(4)	Supply all materials and construct new access road, gate and fencing, electricity, street lighting, drainage, landscaping, pipework and all associated civil works at the New Water Treatment Works.	sum	-	441,000	441,000
(5)	Supply all materials and construct sludge transmission pipeline and sludge treatment facilities.	sum	-	360,000	360,000
					10,741,000
III	Kibuye Reservoir (Phase I) for Kogony Reservoir				
	Supply all materials and construct a new Pump House to accommodate all new raw water pumps, control panels, pipework and fittings.	sum	-	391,300	391,300
					391,300
	Kibuye Reservoir (Phase I) for Kanyakwar Reservoir				
	Supply all materials and construct a new Pump House to accommodate all new raw water pumps, control panels, pipework and fittings.	sum	-	391,300	391,300
					391,300
IV	Treated Water Transmission Pipeline				

Water Supply : Expansion Component

Item No.	Description	Unit	Qty.	Rate	Amount
				US \$	US \$
	Treated Water Mains from Kibuye Reservoir to Kogony Reservoir (Phase I) Supply and lay 400 mm dia. steel raw water pipe	m	6,200	203	1,258,600
					1,258,600
	Treated Water Mains from Kibuye Reservoir to Kanyakwar Reservoir (Phase I) Supply and lay 350 mm dia. steel raw water pipe	m	4,200	171	718,200
					718,200
V	Reservoirs				
	Kibuye Reservoir (Phase I) Supply all materials and construct reinforced concrete twin compartment water storage reservoir of 27,000 m3 capacity including all pipework, valves, fittings, chambers, interconnection pipework, drainage and all civil works for Phase I.	sum	-	1,190,000	1,190,000
					1,190,000
	Kogony Reservoir (Phase I) Supply all materials and construct reinforced concrete twin compartment water storage reservoir of 3,500 m3 capacity including all pipework, valves, fittings, chambers, interconnection pipework, drainage and all civil works for Phase I.	sum	-	300,000	300,000
					300,000
	Kanyakwar Reservoir (Phase I) Supply all materials and construct reinforced concrete twin compartment water storage reservoir of 5,000 m3 capacity including all pipework, valves, fittings, chambers, interconnection pipework, drainage and all civil works for Phase I.	sum	-	388,000	388,000
					388,000
VI	Trunk Main (Pipe diameter 150 mm and larger)				
	Phase I				
	800 SP	m	5,000	491	2,455,000
	650 SP	m	2,375	377	895,375
	600 SP	m	2,000	340	680,000
	500 SP	m	7,500	270	2,025,000
	450 SP	m	750	236	177,000
	400 SP	m	5,750	203	1,167,250
	350 SP	m	2,125	171	363,375
	315 PVC	m	6,250	75	468,750
	280 PVC	m	2,750	62	170,500
	225 PVC	m	5,000	45	225,000
	160 PVC	m	9,875	29	286,375
					8,913,625
VII	Service Main (Pipe diameter smaller than 150 mm)				
	Phase I (Total length = 330 km)	sum	-	5,022,000	5,022,000
					5,022,000

COST BREAKDOWN FOR UNACCOUNTED-FOR WATER REDUCTION PROGRAM

SUPPLY CONTRACT : UF-S1

	Quantity	Unit Cost JPY	Total Cost JPY
Water Meters for Replacement	11,000	4,000	44,000,000
Water Meters for New House Connections	40,000	3,125	125,000,000
Leakage Detectors and Computer:	L.S.		6,000,000
Total Amount			175,000,000
		US\$	1,400,000
			1 US\$ = 125 JPY

CONSULTANCY SERVICE FOR UNACCOUNTED-FOR WATER REDUCTION

Senior Engineer					
		8 man/months			
Junior Engineer		8 man/months			
Computer Specialist		1 man/month			
Total		17 man/months			
17 m/m x	JPY	2,800,000	=		47,600,000
47,600,000 /	70% =				68,000,000
(assuming 70% for net remuneration for foreign engineer)					
				US\$	544,000

COST BREAKDOWN FOR MANAGEMENT/INSTITUTIONAL IMPROVEMENT

SUPPLY CONTRACT : MI-S1

	Quantity	Unit Cost US\$	Total Cost US\$
Computer	L.S.		50,000
Other equipment	L.S.		150,000
Total Amount			200,000

CONSULTANCY SERVICE FOR MANAGEMENT/INSTITUTIONAL IMPROVEMENT

Management Specialist		18 man/months	
Financial Specialist		10 man/months	
Computer Specialist		10 man/month	
	Total	38 man/months	
	38 m/m x	JPY 2,800,000	= 106,400,000
	106,400,000 /	65% =	163,692,308
(assuming 65% for net remuneration for forcing engineer)			US\$ 1,300,000

COST BREAKDOWN FOR CONSULTANCY SERVICES

DETAILED DESIGN

Chief Engineer	12 man/months
Civil Engineer (1)	12 man/months
Civil Engineer (2)	12 man/months
Mechanical Engineer	6 man/months
Electrical Engineer	6 man/months

Total 48 man/months

48 m/m x JPY 2,800,000 = 134,400,000

134,400,000 / 70% = 192,000,000
(assuming 70% for net remuneration for foreign engineer)

US\$ 1,500,000

CONSTRUCTION SUPERVISION

Chief Engineer	36 man/months
Civil Engineer	26 man/months
Mechanical Engineer	14 man/months
Electrical Engineer	14 man/months
Pipeline Engineer (Trunk)	26 man/months
Pipeline Engineer (Service)	24 man/months

Total 140 man/months

140 m/m x JPY 2,800,000 = 392,000,000

392,000,000 / 70% = 560,000,000
(assuming 70% for net remuneration for foreign engineer)

US\$ 4,500,000

Direct Construction Cost for Sewerage Facilities

Proposed Facilities		Remarks	Cost x 1,000 US\$
I Sewers			
1	Trunk Sewers		9,526
	Central WTD	Phase I, Expansion Dia. = 250 to 400 mm, L=2.6 km	205
	Eastern WTD	Phase I, Rehabilitation Phase I Dia. = 375 mm, L=0.42 km Dia. =125 to 1,100 mm, L=22.6 km	60 3,737
2	Branch Sewers		
2.1	Sewers for Conventional Sewerage (Street Sewers)		
	Central WTD	Phase I, Expansion Dia. = 200 mm, L=4.2 km	167
	Eastern WTD	Phase I, Expansion Dia. = 200 mm, L=122.5 km	4,902
2.2	Sewers for Shallow Sewer System (Communal Sewers) (supply of pipe materials only)	Phase I, Expansion Dia. = 100 mm, L=91.0 km	455
II Pump Stations			1,130
	Central WTD		
	Sunset Hotel P.S.	Phase I, Rehabilitation 1.26 m ³ /min, H=40 m	110
	Kendu Lane P.S.	Phase I, Rehabilitation 1.20 m ³ /min, H=13 m	59
	Mumias Road P.S.	Phase I, Rehabilitation 1.62 m ³ /min, H=10 m	61
	Eastern WTD		
	Labour College P.S.	Phase I, Expansion 0.72 m ³ /min, H=9 m	42
	Nyalenda STW P.S.	Phase I, Expansion 35.30 m ³ /min, H=2 m	858
III Sewage Treatment Works			3,578
	Conventional STW (Central WTD)		
		Phase I, Rehabilitation mainly, replacement of mecha./elec. equipment	864
		Phase I, Expansion from 6,800 to 14,600 m ³ /day	1,330
	Nyalenda STW (Eastern WTD)		
		Phase I, Rehabilitation mainly, desludging for facultative ponds	234
		Phase I, Expansion from 11,000 to 18,000 m ³ /day	1,150
IV Total Direct Construction Cost			
	Total		14,234
	Phase I, Rehabilitation Components		1,388
	Phase I, Expansion Components		12,846

Direct Construction Cost of Trunk Sewers to be replaced in the Central WTD

Sewer No.	Dia. (mm)	Length (m)	Earth Cover (m)		Supply and Installation Cost (US\$)		
			in	out	Material	Unit Cost	Cost
RP-3	250	651	1.5	1.1	uPVC	50	32,550
RP-2	300	764	1.5	0.5	uPVC	79	60,356
RP-4-1	350	217	1.5	0.8	uPVC	93	20,181
RP-9	350	803	3.6	1.5	uPVC	93	74,679
RP-6	400	156	1.5	2.9	CP	111	17,316
Phase I, Total		2,591 m					205,082

Direct Construction Cost of Trunk Sewers in the Eastern WTD

Sewer No.	Dia. (mm)	Length (m)	Earth Cover (m)		Supply and Installation Cost (US\$)			Remarks
			in	out	Material	Unit Cost	Cost	
22	125	530	1.5	1.5	PVC(Pressure)	70	37,100	
1	250	860	2.5	3.1	uPVC	50	43,000	
8	250	530	2.5	2.1	uPVC	50	26,500	
20	250	500	1.5	2.4	uPVC	50	25,000	
21	250	460	1.5	1.5	uPVC	50	23,000	
23	250	820	1.7	1.5	uPVC	50	41,000	
25	250	420	2.0	3.1	uPVC	50	21,000	
26	250	380	3.1	2.9	uPVC	50	19,000	
2	350	1,190	3.1	1.5	uPVC	93	110,670	
3	350	280	1.5	2.2	uPVC	93	26,040	
9	350	1,070	2.2	2.1	uPVC	93	99,510	
13	350	1,040	2.5	1.6	uPVC	93	96,720	
24	350	580	1.5	3.8	uPVC	93	53,940	
C-3	375	420	0.0	1.4	CP	141	59,220	Rehab.
4	400	460	2.0	1.7	CP	111	51,060	
27	400	380	4.0	6.4	CP	137	52,060	
28	400	430	6.7	5.3	CP	137	58,910	
17	400	14	1.5	2.2	CP	144	2,016	
18	400	381	2.4	1.5	CP	144	54,864	
19	400	325	1.8	1.5	CP	144	46,800	
5	450	560	1.6	2.3	CP	117	65,520	
10	450	960	2.3	1.5	CP	117	112,320	
33	450	1,100	1.5	2.8	CP	117	128,700	
29	450	780	5.4	1.5	CP	142	110,760	
11	500	400	1.8	1.5	CP	132	52,800	
34	600	1,330	2.5	1.5	CP	175	232,750	
6	600	1,000	2.1	4.4	CP	205	205,000	
7	600	520	4.3	2.7	CP	205	106,600	
35	600	260	1.5	1.7	CP	260	67,600	
30	600	178	3.4	2.4	CP	285	50,730	
12	700	870	1.8	1.5	CP	229	199,230	
31	700	340	1.9	1.9	CP	342	116,280	
14	800	520	3.3	1.5	CP	320	166,400	
15	800	1,470	3.5	1.5	CP	320	470,400	
16	800	810	2.6	1.5	CP	320	259,200	
32	1,100	380	2.0	1.2	CP	560	212,800	
36	1,100	220	1.2	2.1	CP	560	123,200	
37	1,100	300	1.4	0.9	CP	560	168,000	

Total Cost
 dia. 125 - 1,100 Length = 23,068 m 3,795,700 US\$

Rehabilitation Cost 59,220 US\$
 Expansion Cost 3,736,480 US\$

Direct Construction Cost for Branch Sewers under the Phase I Project

WTD	Area (ha)	Branch Sewers Installation		Estimation, US\$	
		m/ha	m	Unit Cost	Cost
Eastern WTD					
sub-district A	369.5	80	29,560	40	1,182,400
sub-district B	774.9	120	92,988	40	3,719,520
Sub-total	1,144.4		122,548		4,901,920
Central WTD	52.2	80	4,176	40	167,040
Phase I, Total	1,196.6		126,724		5,068,960

**Supply Cost of Shallow Sewers
under the Phase I Project**

Population covered by Communal Sewers (2005)	82,712
Number of households covered by Communal Sewers (2005)	13,785
Communal sewer length required (6.6m/household) :	90,981 m
Pipe material : uPVC, 100 mm	
Pipe material cost: 5 US\$/m	
Supply cost of communal sewer	454,905 US\$

Construction Cost for Sewage Treatment Works under the Phase I Project

Description	Phase I		Total
	Rehabilitation	Expansion	
I. Conventional STW			
1. Rehabilitation Works			
1) Inlet Works	13,126		13,126
2) Oil Separator	99,999		99,999
3) Biological Filters	14,994		14,994
4) Primary Sedimentation Tanks	108,087		108,087
5) Secondary Sedimentation Tanks	108,087		108,087
6) Sludge Pumps	74,581		74,581
7) Recalculation Pumps	94,003		94,003
8) Sludge Digestors	208,336		208,336
9) Workshop Equipment	9,418		9,418
10) Security Lighting	100,000		100,000
11) Fencing	33,200		33,200
Sub-Totals	863,831		863,831
2. Expansion Works			
1) Inlet Works		29,643	29,643
2) Primary Sedimentation Tanks		55,000	55,000
3) Biological Filters		903,071	903,071
4) Secondary Sedimentation Tanks		172,143	172,143
5) Sludge Thickening Tanks		155,000	155,000
6) Sludge Drying Beds		11,000	11,000
7) Miscellaneous Pipework		2,858	2,858
Sub-Totals		1,328,715	1,328,715
Total of I.	863,831	1,328,715	2,192,546
II. Nyalenda STW			
1. Rehabilitation Works			
1) Inlet Works	3,643		3,643
2) Anaerobic Ponds	-		-
3) Facultative Ponds	124,786		124,786
4) Maturation Ponds	105,500		105,500
Sub-Totals	233,929		233,929
2. Expansion Works			
1) Inlet Works		69,286	69,286
2) Anaerobic Ponds		913,643	913,643
3) Facultative Ponds		161,071	161,071
4) Maturation Ponds		5,857	5,857
Sub-Totals		1,149,857	1,149,857
Total of II.	233,929	1,149,857	1,383,786
III. Grand Total	1,097,760	2,478,572	3,576,332