

Part 2 Methodology of Water Leak Reduction

PART 2: METHODOLOGY OF WATER LEAK REDUCTION

1. GENERAL

Water leaks are considered waste of valuable water resources. Water leaks also represent loss of products which are produced through water treatment plant and at a considerable cost of labor, chemical, power supply and others. Therefore, an increase in water leaks means unsound administrative of the water utility. Water leaks result in pressure drops which cause the improper supply of water.

Water leaks also accelerate the deterioration of water supply facilities by overloading them. Furthermore, when service is suspended by accidents, excavation work, pipe breaks and bursts, waste water may flow into water mains through leaks, thus increasing the risk of contamination.

Water utilities must make full use of water resources by decreasing the water leak ratio through effective detection measures. It may takes a long time to see detection measure to improve the water leak ratio. Therefore, water leak detection and presentation measures must be steadily promoted based on long term plans.

1.1 Aims of Water Leak Reduction

a) To maximize utilization of limited water resources.

Development of new water resources presents growing difficulties, such as longer times and high costs. Therefore, it is of immediate necessary to make full use of existing water sources by reducing leakage.

b) To improve economy

City water is provided at a considerable cost of labor, water treatment and power supply. Leakage represents an economic loss that may lead to unsound water administration.

c) To protect against poor flow and water contamination resulting from pressure drops.

Water leaks cause pressure drops which in turn lead to low flow levels at outlets. During water-service interruption due to accidents or construction, waste water sometimes will flow into water lines through leaks, thus increasing the risk of contamination.

1.2 Pipelines

Generally , pipeline such as distribution and service pipes are :

- a) Laid under the ground to escape the notice of people
- b) Always under high water pressure
- c) Repeatedly loaded by vehicles and other means of transportation.
- d) Subject to corrosion by corrosive soil, by strong electric current and other factors.
- e) Easily damaged by various types of excavation.

Under these adverse conditions, pipelines always face the risk of water leaks. Most water leaks occur from pipelines of waterworks facilities.

Water leaks from pipelines vary in volume. Small water leakage rarely flows above the ground. On the other hand, certain volumes of water leakage tend to flow above the ground (visible leaks). When high-grade pavement is installed or sewage pipes exist

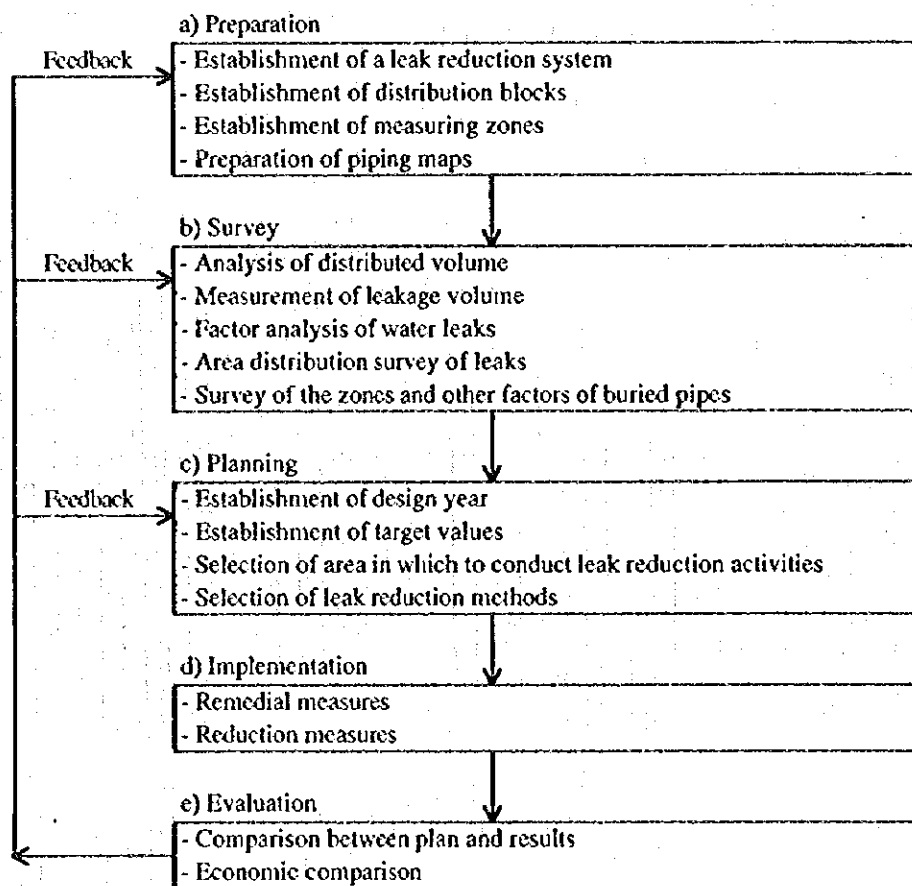
around water supply pipelines, even certain volumes of water leakage do not flow over the ground. Instead, they keep seeping into the ground (Nonvisible leaks). Nonvisible leaks are difficult to notice on spot. Therefore, they accumulate and reduce the revenue and effective supply ratio. In order to reduce water leaks, attention should be paid to all the waterworks facilities from water sources to service areas. However, based on the aforementioned facts, various water leaks detection measures usually focus on "nonvisible leaks from pipelines"

1.3 Water Leak Reduction Measure

a) Procedure of water leak reduction measures.

The ordinary procedure of water leak reduction measures is shown in the following chart.

Procedure for Water Leak Reduction Measures



After establishing and implementing water leak reduction plans, planners must establish a system in which results are feed back properly to future reduction plans.

2. REASONS OF WATER LOSS IN HANOI

2.1 Physical Losses

Water loss in the network occurs mainly in the remained old pipelines which occupied 36% of total distance, as of December 1995.

2.2 Administration Loss

- a) Illegal connections
- b) Excess use over the flat rate
- c) Waste of water at public taps, pavement reservoirs and public reservoirs
- d) Water use for wrong purposes
- e) Water use for business without registration
- f) Incorrect billing and tariff enforcement
- g) Unbilled connections, assumed "dead" connections

3. WATER LOSS COMPONENTS

a) In the transmission lines:

- In the old line: 2.5%
- In the new line : 0.5%

b) In the distribution network (80m/m - 225m/m) : 11%

- On the old line : 8%
- On the new line : 3%

c) In the service line in alleys and communes, small-sized pipeline (< 80m/m) under the management of the company : 15%

d) At 800 public taps : 10%

e) Non-revenue water : 24%

*The above is from "Water Loss and Non-revenue Reduction Prompt Action Plan (1995 - 1996)".

4. METHOD OF LEAKAGE REDUCTION

4.1 General

The exact percentage of leakage could be defined based on the result of the survey. However, it can be said that areas where pipelines were replaced with new pipes during 1985 - 1995 show lower percentage than areas where pipelines were installed before 1985. Therefore, it is recommended that old pipelines should be replaced according to "Networks Rehabilitation Schedule".

Leakage reduction activities shall be commenced from areas where pipelines were replaced. The method for the leakage reduction was already presented in the report of "Water Loss Reduction Program" submitted by FINNIDA. Furthermore, TUWPS prepared in 1995 "Water Loss and Non-revenue reduction prompt Action Plan, 1995 - 1996". This plan shall be revised based on the "Networks Rehabilitation Schedule" to a new activity plan. Water loss reduction program requires to form proper organization for the program and it shall be implemented from a long-term viewpoint.

4.2 Basic Conditions for Leakage Reduction Program.

- (1) Good understanding of the present situation on the water supply condition by each Water Supply Business Enterprise maintaining pipelines and service connections and abstract of various problems causing water leakage.
- (2) Preparation and continuous revise of pipeline networks drawings.
- (3) Reduction of unaccounted-for water (UFW).

(4) Orientation and training to personal of HWBC, regarding leakage reduction program.

(5) Enforcement of completion test, including water pressure test, upon completion of pipe installation work.

(6) Increase of number of water meter installation on service connections.

(7) reduction of number of public water taps.

(8) Supply to each service area under proper water pressure.

(9) Strengthening of operation and maintenance organization to carry out leakage reduction shall be established. Financing for its execution is also required.

Taking above into consideration, practical method and organization to carry out leakage reduction shall be established. Financing for its execution is also required.

APPENDIX A-7 Water Quality Survey for the Tap Water

Water Quality Survey for Tap Water

Water quality survey for taps of end users was done at ten (10) points in the urban area where there are piped-water service by HWBC. Residual chlorine, total coliform and total bacteria were analyzed on the site by simplified methods. Location of survey points are shown in Figure A7a, and methods and results of the survey are shown in Table A7b.

Water quality of taps seems to be generally in good condition judging from the survey results. Most consumers seem to be satisfied with water quality, especially survey at newly constructed houses. However some of them complained about pungent odor of chlorine at the points No.2, No.4, No.8 and No.3' where residual chlorine concentration of more than 0.5 mg/l appeared. Consumers complained of red worm at two points No. 6 and No. 7, but tap water does not seem to be seriously polluted because no coliform appeared. Coliform was found at only one point No.3 where water pressure and concentration of residual chlorine are rather low.

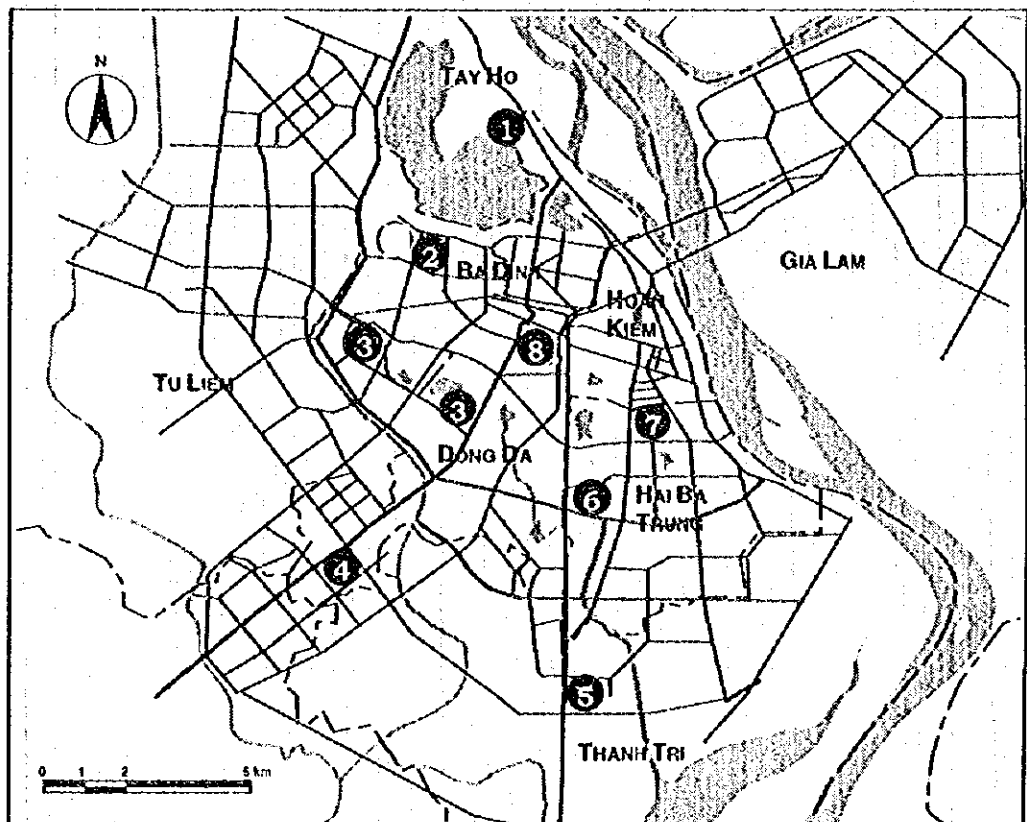


Figure A7a Location Map of the Tap Water Quality Survey

Table A7b Methods and Results of Tap Water Quality Analysis

No.	Survey Points	Time		Water quality			Condition of water supply to the house and Sampling method	Method of analysis			Remarks		
		Date	Time	Weather Condition	Total Coliform (n/ml)	Total bacteria (n/ml)		Residual Chlorine (mg/l)	Water Temperature (C)	Total Coliform		Total Bacteria	Residual Chlorine
1	81 Lang Yen Phu	17/4/96	14:00	Cloudy	0	4	1.0	24	MILLIPORE Coli-Count sampler, incubation (for 24 h, at 35°C), Counting the number of colonies	MILLIPORE Total-Count Sampler, incubation (for 24 h, at 35°C), Counting the number of colonies	Colourimetric method by octadecalin 1% reagent	Not have enough water in Summer. Water pressure is rather low. Water quality is comparatively good (?).	
2	To-67, Ngoc Khanh, Tran Phuc Bang	18/4/96	8:30	Fine	0	1	1.0	27.5	Sampling directly from distribution pipe through the tap. One meter for 2 households	Ditto	Ditto	No complain about water quality or low pressure, even in Summer. Pungent odour always appear	
3	Nguyen Xuan Hop to 1 Lang Ha	22/4/96	14:30	Fine	2	25	0.1	28	Sampling directly from distribution pipe through the rubber tube connecting with tap. No meter	Ditto	Ditto	Enough water even in Summer. No complain about water quality. In recent months, water pressure is rather low	
4	Nguyen Huu Mong 23 D khu tap the thuc la Thang long, Thanh Xuan Bac Thuong Dinh	19/6/96	9:30	Cloudy	0	0	1	24	No meter. Newly constructed building. Sampling directly from distribution pipe through the tap	Ditto	Ditto	Have water almost 24h. Newly constructed building. Pungent odour appear sometime	
7	Truong Mam non Viet Bum, Pho Huong Yem (Dong Nhan cu)	19/6/96	15:05	Cloudy	0	0	0.5	26	No meter. Sampling directly from distribution pipe through the tap	Ditto	Ditto	Enough water. Red worm in the reservoir sometime	
8	No 14 ngo 221 Pham Thi Bach Hai	14/5/96	15:30	Sunny	0	10	0.5	26	2 taps existing in parallel next to the tank. One valve & meter. Sampling directly from distribution pipe through the tap.	Ditto	Ditto	> One year constructed. Low water pressure rather low in recent months. No complaining about water quality. Pungent odour sometime appear	
5	Le th Bach Huong, B7 Xom Trung Khanh Thinh Liet	15/5/96	10:40	Fine	0	3	0.3	27	Newly constructed for a month. Sampling from contribution pipe through the tap. One meter & valve	Ditto	Ditto	Enough water	
6	Le Thi Khanh 306 Ngo An Son Dai La	21/5/96	10:30	sunny	0	1	0.5	26	Sampling directly from contribution pipe through the tap. One meter & valve	Ditto	Ditto	Constructed since 1993. Enough water even in the summer. Red worm sometime appears in the pipeline	
3	Do Thi Hoa, To 35 Phuong Lang Thuong	26/4/96	9:15	Cloudy	0	2	1.0	24	Newly developed house with 3 stories no meter	Ditto	Ditto	No complain about water quality, quantity. Pungent odour always appear	
2	Dean 851 Tong cuc hau can Phuong Cong Vi	19/6/2/5	11:35	sunny	0	0	0.07	30	Newly construction house	Ditto	Ditto	Just newly construct for 2 months. No complaining about water quality, quantity	
AVERAGE								0	5	0.6	26		

APPENDIX A-8 Hydrogeological Data

- (a) Transmissivity of Aquifer Qa
- (b) Piezometric Head of Aquifer Qa in Observation Wells
- (c) List of Private Well

(a) Transmissivity of Aquifer Qa(1/2)

Area	No.	Well	Transmissivity (m ² /d)	Average (m ² /d)/(m ² /sec)	Remarks
Soc Son	1	Soc Son I	470		Well: Proposed wellfield by K2 Trans.: Average of the wellfield
	2	Soc Son II	400	368 / 4.25x10 ⁻³	
	3	Soc Son III	270		
	4	Soc Son IV	330		
	Total		1,470		
Dong An	1	607	483		
	2	608	353		
	3	609a	987		
	4	610	578		
	5	611	689		
	6	612	991		
	7	613	590		
	8	614	508		
	9	615	867		
	10	616	639		
	11	617	1,035	605 / 7.00x10 ⁻³	
	12	618	1,241		
	13	619	1,121		
	14	620	1,554		
	15	621	541		
	16	LK1	647;420		
	17	H6	510		
	18	H7	459		
	19	LK34	261;327;208		
	20	LK32	412;429;508		
	21	LK5	180;181		
	22	LK8	280;540		
Total		17,539			
Gia Lam	1	820	957		
	2	4HN	1,026		1,628 / 1.90x10 ⁻²
	3	49	2,900		
	Total		4,883		

(a) Transmissivity of Aquifer Qa(2/2)

Area	No.	Well	Transmissivity (m ² /d)	Average (m ² /d)/(m ² /sec)	Remarks
S.H	1		44	700	
	2		45	980	
	3		46	1,220	
	4		47	1,480	
	5		48	1,280	
	6		49	2,900	
	7		56	800	1,443/1.67X10 ⁻²
	8		812	1,520	
	9		816	1,020	
	10		H10	1,420	
	11		TD7	1,560	
	12		YL	2,320	
	13		PV	1,560	
		Total	18,760		

(b) Piezometric Head of Aquifer Qa in Observation Wells(1995)

Area	No.	Well	Head(Elevation: m)		Remarks
			Max.	Min.	
Soc Son	1	Q15	9.55	8.40	
	2	P66	8.80	6.25	
	3	P68a	7.25	3.75	
Dong Anh	1	P65b	10.25	4.25	
	2	P65a	10.20	4.30	
	3	P67b	8.00	6.00	
	4	P69a	8.15	6.35	
	5	P72a	8.75	4.70	
Gia Lam	1	P13a	7.90	3.80	
	2	P15a	6.00	2.70	
	3	P49a	8.50	2.55	
	4	Q33a	6.30	4.00	
	5	Q34a	5.50	3.80	
	6	Q35	5.40	4.10	Gia Lam North
Tu Liem	1	P12a	-5.50	-7.00	
	2	P21a	0.70	-1.75	
	3	P29a	-9.10	-9.90	
	4	P44a	-1.25	-1.70	
	5	P52a	-6.10	-6.90	
	6	P55a	10.00	4.65	
Than Tri	1	P1a	5.20	1.10	
	2	P40a	-0.60	-1.20	
	3	P48a	-10.90	-11.50	
	4	P50a	4.40	-1.10	
	5	P60a	-3.60	-6.50	
	6	Q68b	-4.30	-5.90	Ha Dong
Urban	1	P17a	5.60	1.30	
	2	P26a	3.60	-1.55	
	3	P32a	-2.05	-6.70	
	4	P39a	-0.50	-5.70	

(e) List of Private Well (1994, by K2)(1/6)

No.	Name of Owner	Coordinate		District	No. of Well	Ave. Dis. (m ³ /day)
		X	Y			
1	Logistical-General Divi.No.2	31	83	T.L.	2	840
2	Concret Enter. of Hanoi	32	80			800
3	Cau Dien Freeze Factory	26	78		5	640
4	Poultry Breed Service Co.	30	78			480
5	Mine-Geology Univ.(A)	31	80			420
6	Jail Hanoi	26	78		2	380
7	Brick Plant H.H.	22	77			375
8	Chemical Institute CD	28	78			360
9	Station 190 Min. of Interior	31	80		3	360
10	Mine, Geology Univ.(B)	31	80			350
11	VN Science Insti.	28	73			350
12	Mechanic Factory No. 5	24	77			285
13	Paint Factory	28	79			240
14	Police Univ.	30	79			240
15	Forest Science Insti.	31	80			220
16	Unit 2910	25	79			210
17	Army Engineering Institute	31	80			200
18	Gymnastic Center Nhon	29	76			180
19	Chemical Installation Enter.	31	82			180
20	N.V.X. Resident School	25	82			180
21	Factory z191	28	78			150
22	Concrete Factory	28	77			150
23	Collec. Quarter of Army	28	77		2	120
24	Air Unit 19012	32	84		3	115
25	Geological Division 10	27	78			105
26	Bread Co. Cau Dien	26	78			105
27	Breed Test Center	24	80			100
28	Air Regiment 280	28	76			100
29	Army University	26	80			100
30	Finance Univ.	31	80			100
31	Army Workshop 5	28	78			90
32	Army Print Factory	28	78			87
33	Technical School	29	76			87
34	Weapon Test Center	29	75			80
35	Textile Co. of Hanoi	31	82			80

(c) List of Private Well (1994, by K2)(2/6)

No.	Name of Owner	Coordinate		District	No. of Well	Ave. Dis. (m ³ /day)
		X	Y			
36	Constructive Survey United	31	80	T.L.		80
37	Technical School No.1	28	76			72
38	Vegitation Protection Insti.	31	80		2	72
39	Battalion 60	28	76			60
40	T.89 Logistical College	31	84			55
41	Mechanical Factory DM	25	77			50
42	Treated Waste Water Fac.	26	78			50
43	Chemical Soil Insti.	31	80			50
44	Mechanical Enterprise MT	25	80			40
45	Print Technical School	28	77			37
46	Gen. Store of Industry Min.	27	78			37
47	Enterprise 24/6	32	75			30
48	Isolation Fac.	27	78			27
49	Brick Factory	26	77			26
50	Meteorology School	28	79			26
51	Radio Station Center	28	77			25
52	K.10 Min. of Interior	30	84		2	16
53	Practical School for Workers	31	75			15
54	Army Print Factory	25	80			14
55	A.32 Collge	30	84			10
56	Railway Survey & Design Ent.	24	83			10
57	Mobil Police C990	31	84			9
58	High Command of Army Eng.	23	79			6
59	Chicken Farm PD	28	79			3
60	Guest House of Interior Min.	27	76			1
Total					73	9,680
61	Hanoi Textile Fac.	22	90	H.B.	4	9,600
62	8-3 Textile Fac.	22	89		5	8,000
63	M.K. Textile Fac.	23	90			1,120
64	T.L. Germent Enter.	22	89			224
Total					11	18,944
65	G.S. Rubber Co.	23	84	D.D.	4	8,880
66	Garment Fac.	22	87			1,980
67	Q.T. Mechanical Fac.	21	87			560
68	Tool Design Fac. No.1	23	84			400

(c) List of Private Well (1994, by K2)(3/6)

No.	Name of Owner	Coordinate		District	No. of Well	Ave. Dis. (m ³ /day)
		X	Y			
69	Traditional Military Hos.	21	85	D.D	2	390
70	Traditional Medical Hos.	20	85			240
71	T.L. Concret Fac.	20	87			210
72	T.L. Food Enter.	21	87			180
73	Assis. & Devel. Unit of Sci.	22	86			175
74	Mineral-Geology Insti.	21	82			150
75	Hanoi Detergent Co.	22	84			121
76	B.S. Cement Co.	22	87			105
77	Hanoi Medical Univ.	23	86			48
78	Roof Board Produc. Co.	18	83			25
79	Collective Families of Army	20	85			12
80	Air Hospital	20	85			12
Total					20	13,488
81	Hanoi Brewery Co.	28	85	B.D.	4	4,920
82	Uncle Ho Musolium	27	86		6	2,957
Total					10	7,877
83	V.D. Fertilizer Fac.	17	86	T.T.	4	9,600
84	Hanoi Paint Fac.	18	84			2,880
85	V.D. Battery Fac.	17	86		2	2,560
86	Transportation Enter.	15	87			1,800
87	Forest Investigation Insti.	15	87			440
88	T.T. Ceramic Fac.	22	92			400
89	T.T. Water Plant	17	87		2	280
90	Forestry Machinery Design Co.	16	87			245
91	Car Enter. 210	16	87			225
92	Transportation Fac.	18	87			175
93	Const. Mechanic Fac.	14	88			166
94	Meatal Workshop	17	86			150
95	Export Shoes Fac.	21	91			140
96	Print. Workshop of Gen. Staff	15	88			120
97	G.P. Mechanic Fac.	18	84			90
98	G.Water Collect. Families	18	87			90
99	Finance College	18	84			90
100	Agricul. Training School	15	87			70
101	Fruits, Vegetables Enter.	14	88			60

(c) List of Private Well (1994, by K2)(4/6)

No.	Name of Owner	Coordinate		District	No. of Well	Ave. Dis. (m3/day)
		X	Y			
102	Hospital GI	18	86	T.T		60
103	Barracks 66H	15	88			50
104	Agricultural Insti.	16	87			48
105	Agricultural Hospital	14	88			45
106	Business Wrapper Co.	15	88			42
107	Collective Area 664	18	84			40
108	Underground Works Co.	18	83			30
109	Hanoi Needle Fac.	18	84			30
110	Agricultural Material Co.	15	88			30
111	Monument Construct. Co.	18	87			22
112	Temporary Jail	18	83			15
113	Information Battalion 8	16	88			10
114	Irrigation Mechanic. Fac.	18	87			10
115	LICOLA Co.	16	87			6
Total					38	20,019
116	Agricultural Univ.	27	93	G.L.	2	1,600
117	Garment Co.	26	94		2	1,100
118	Foodstuff Enter. 22	27	93			1,080
119	Y.V. Shoes Co.	32	95			1,040
120	Y.V. Oxygen Fac.	31	94			960
121	Chemical Fac. D.G.	31	92			800
122	Y.V. Mechanical Fac.	32	95			720
123	Petrol Co. of Zone 1	30	92			640
124	Match Fac. T.N.	31	94			560
125	Collect. Area of Match Fac.	31	94			490
126	P.V. Marine Product Enter.	27	90			375
127	Silk Study Center	29	90			320
128	T.B. Brick Plant	26	94			280
129	Factory Z133	31	92			270
130	Collect. Area of Wood Fac.	31	94			270
131	Bridge Co. 14	27	94			240
132	Collect. Area of Mecha. Fac.	31	96			180
133	Constructive Co. 120	33	96			180
134	Chemical Fac. 276	21	99			155
135	G.L. Mechanic Fac.	26	97			150

(c) List of Private Well (1994, by K2)(5/6)

No.	Name of Owner	Coordinate		District	No. of Well	Ave. Dis. (m ³ /day)
		X	Y			
136	N.L. Foodstuff Co.	28	94	G.L.		144
137	Unit J112	30	90			130
138	Collect.of Road Mender 203	26	98			105
139	Enter. X26	30	90			105
140	Material Co.	31	92			105
141	G.L. Hospital	30	93			100
142	Bamboo Export Enter.	21	186			90
143	Foodstuff Gen. Co.	28	91			80
144	G.L. Mechanical Enter.	26	94			80
145	Marine Product Enter.	24	97			80
146	General Politic School	28	91			75
147	G.L. Police Office	25	97			60
148	Cooperative H.L.	28	91			60
149	Spare Parts Co.	28	90			60
150	General Store T.612	23	186			52
151	General Department	27	90			50
152	Collectve Area 16	31	94			50
153	Railway Construct. Enter.	29	91			45
154	Dredge Enter. No.1	22	1			36
155	Chemical Co.	28	91			35
156	Agricultural Science Enter.	21	99			30
157	General Store A	32	95			30
158	Survey Group of Chem. Dep.	28	90			25
159	Ltd. Co. Chuong Duong	29	92			25
160	Post Collect. Area	27	90			20
161	Sand Pebble Enter. No.1	27	90			20
162	T.L. Metal Enter.	27	94			20
163	Brigade 280	26	94			18
164	Hanoi Salt Station	27	90			18
165	Collect. Area of Elec. Branch	29	92			15
166	Workshop 56 of Army	27	90			13
167	Carpet Enter.	20	99			12
168	Mechanical Fac.	27	90			10
169	Y.V. Railway Station	33	95			9
170	Transportation Co. No.2	28	90			5

(c) List of Private Well (1994, by K2)(6/6)

No.	Name of Owner	Coordinate		District	No. of Well	Ave. Dis. (m3/day)
		X	Y			
171	Unit 871	27	90	G.L	3	3
172	Bridge Co. 12	27	94			2
Total					61	13,227
173	N.B. Airport	46	84	S.S	6	2,160
174	Fac. Z125	45	85		2	210
175	K.A. Tea Fac.	45	86			200
Total					9	2,570
176	C.L. Film Workshop	37	88	D.A	2	1,200
177	Fac. Z153	40	89			880
178	T.L. Mechanical Fac.	38	89			720
179	V.H. Motor Fac.	42	88		4	420
180	C.L. Mechanical Fac.	37	88			360
181	Brick Plant P.T.	42	86			360
182	North S.H. Store	38	89			336
183	C.D. Samos Enter.	32	93			300
184	BNV School C32	47	78			290
185	P.T. Chicken Farm	41	86			210
186	Printing Enter.	42	86			150
187	Lorry Fac.	40	89			135
188	Mechanical Fac.	33	93			120
189	Management Econo. School	38	99			90
190	Construct. Elec. 4	39	87			78
191	M.L. Cast Fac.	33	93			70
192	N.H. Mechanical Fac.	41	81			60
193	Concret Enter.	40	79			60
194	Geological Material Co.	33	93			60
195	Pedagogical School	33	93			45
196	Construction Co. No.4	33	93			17
197	C.D. Brick Field	34	91			4
Total					26	5,965
Grand Total					248	91,770

PART II

MASTER PLAN

APPENDIX (B) FRAMEWORK FOR THE MASTER PLAN

- B-1 Future Land Use
- B-2 Population Forecast
- B-3 Survey on Water Usage
- B-4 Field Survey on Private Wells
- B-5 Population Served and Domestic Water
 Demand Forecast by Commune

APPENDIX B-1 Future Land Use

- (a) Future Land Use in Urban District
- (b) Future Land Use in Suburban District
- (c) Future Land Use by Commune
- (d) Percentage of School Age Group
- (e) Percentage of School Attendance
- (f) Planning Standard for the Neighborhood Facility
- (g) Allocation of Neighborhood Facility

FUTURE LAND USE IN URBAN DISTRICT

(ha)

District (Quan)	Year	Commercial Area	Industrial Area	Institution Area	Mixed Use		Village Area	Green Plant.	Others (Road,Sq,Agri)	Total
					a:(present)	b:(future)				
Tay Ho	2000	71.2	0.0	17.8	(162.0)	30.0	46.0	69.0	-	
	2005	16.0	0.0	4.0		10.0	57.0	9.0	-	
	2010	4.0	0.0	1.0		5.0	64.0	2.0	-	
	Total	91.2	0.0	22.8	a+b=(207.0)	45.0	167.0	80.0	1,339.8	1,907.8
Ba Dinh	2000	109.6	0.0	27.4	(515.0)	2.0	-	86.0	-	
	2005	0.0	0.0	0.0		2.0	-	21.0	-	
	2010	0.0	0.0	0.0		1.0	-	0.0	-	
	Total	109.6	0.0	27.4	a+b=(520.0)	5.0	-	107.0	151.8	915.8
Hoan Kiem	2000	69.6	0.0	17.4	(407.0)	-150.0	-	80.0	-	
	2005	0.0	0.0	0.0		-80.0	-	0.0	-	
	2010	0.0	0.0	0.0		-10.0	-	1.0	-	
	Total	69.6	0.0	17.4	a+b=(167.0)	-240.0	-	81.0	82.2	417.2
Dong Da	2000	157.6	193.0	39.4	(697.0)	99.0	-	106.0	-	
	2005	4.8	4.0	-1.2		20.0	-	20.0	-	
	2010	2.4	3.0	0.6		2.0	-	-2.0	-	
	Total	155.2	200.0	38.8	a+b=(818.0)	121.0	-	124.0	148.6	1,484.6
Hai Ba Trung	2000	51.2	112.0	12.8	(646.0)	-13.0	-	51.0	-	
	2005	2.4	30.0	0.6		-10.0	-	12.0	-	
	2010	0.0	24.0	0.0		-8.0	-	-9.0	-	
	Total	53.6	166.0	13.4	a+b=(615.0)	-31.0	-	54.0	206.0	1,108.0
Total of Urban		479.2	366.0	119.8	2,496.0	-	167.0	446.0	1,928.4	5,833.4
		8.2%	6.3%	2.1%	42.8%	-	2.9%	7.6%	33.1%	100.0%

Remarks:

"Mixed Use Area" includes small industries & urban houses

"Public works (categorized by FINNIDA)" area divided to "Institution" and "Commercial" area

"Institution Area" includes public buildings, research and educational buildings etc.

"Present Data" is data on 1990

Source/ "Water Master Plan of Hanoi City / Final Report, April 1993" by FINNIDA

(Some figures are adjusted to meet to trend of the population forecast for each target year which done by the Study team)

FUTURE LAND USE IN SUBURBAN DISTRICT

(ha)

District (Muyen)	Year	Commercial Area	Industrial Area	Institution Area	Mixed Use Area	Residential Area	Village Area		Water Area (Lake, Pond)	Others (Agricul. etc)	Total
							a:(present)	b:(future)			
Soc Son	2000	6.0	50.0	0.0	-	133.8	(1,036.8)	152.1	-	-	-
	2005	15.0	250.0	0.0	-	294.3		206.9	-	-	-
	2010	19.0	130.0	0.0	-	107.0		247.2	-	-	-
	Total	40.0	430.0	0.0	0.0	535.1	a+b=(1,643.0)	606.2	537.0	28,281.8	31,466.9
Dong Anh	2000	50.0	200.0	10.0	-	310.0	(804.9)	395.0	-	-	-
	2005	170.0	70.0	15.0	-	90.0		365.1	-	-	-
	2010	140.0	120.0	0.0	-	149.0		425.0	-	-	-
	Total	360.0	390.0	25.0	0.0	549.0	a+b=(1,990.0)	1,185.1	453.0	15,153.0	18,920.0
Gia Lam	2000	70.0	300.0	0.0	-	242.0	(1,209.1)	248.5	-	-	-
	2005	60.0	150.0	0.0	-	205.7		290.9	-	-	-
	2010	44.0	86.0	0.0	-	157.3		206.1	-	-	-
	Total	174.0	536.0	0.0	0.0	605.0	a+b=(1,954.6)	745.5	24.2	10,516.2	13,810.0
Tu Liem	2000	100.0	80.0	20.0	80.0	391.3	(223.6)	32.1	-	-	-
	2005	250.0	100.0	30.0	70.0	587.0		37.2	-	-	-
	2010	272.7	157.2	40.0	34.6	978.3		57.0	-	-	-
	Total	622.7	337.2	90.0	184.6	1,956.6	a+b=(349.9)	126.3	14.8	5,569.4	9,125.2
Thanh Tri	2000	35.0	70.0	0.0	650.0	-	(783.9)	51.7	-	-	-
	2005	70.0	120.0	0.0	700.0	-		54.9	-	-	-
	2010	55.0	102.0	0.0	460.1	-		48.5	-	-	-
	Total	160.0	292.0	0.0	1,810.1	0.0	a+b=(939.0)	155.1	567.7	6,136.9	9,905.7
Total of Suburban		1,356.7	1,985.2	115.0	1,994.7	3,645.7	6,876.5		1,596.7	65,657.3	83,227.8
		1.6%	2.4%	0.1%	2.4%	4.4%	8.3%		1.9%	78.9%	100.0%

Remarks: "Mixed Use Area" includes all of urban functions

"Institution Area" includes new public buildings, research and educational buildings

"Residential, Village, Water & Other Area" are not accumulated by each target year. Water demand for these area to be refereed population forecast.

Source/ Existing Topographic Map (1:50,000), "The Master Plan of Urban Transport for Hanoi City in Vietnam" by JICA, 1996

Hanoi city development plan by the National Institute for Urban and Rural Planning (URP) of the Ministry of Construction in collaboration with Hanoi Urban Planning Institute (UPI)

FUTURE LAND USE BY COMMUNE

(ha)

District (Quan)	Commune (Phuong)	Commerc Area	Industrial Area	Institution Area	Mixed Use Area	Resident. Area	Village Area	Green & Park Area	Water Area	Total Area
Tay Ho	01 Buoi	0.0	0.0	0.0	0.0	0.0	56.0	0.0	46.0	106.0
	02 Thuy Khue	0.0	0.0	0.0	29.0	0.0	0.0	0.0	30.0	51.5
	03 Yen Phu	0.0	0.0	0.0	18.0	0.0	30.0	0.0	5.6	96.5
	04 Nhat Tan	10.0	0.0	0.0	0.0	28.0	13.0	0.0	22.5	299.6
	05 Phu Thuong	20.0	0.0	0.0	0.0	398.0	0.0	0.0	0.0	609.5
	06 Quang An	0.0	0.0	0.0	0.0	0.0	51.0	0.0	0.0	188.2
	07 Tu Lien	0.0	0.0	0.0	0.0	0.0	17.0	0.0	0.0	344.0
	08 Xuan La	20.0	0.0	0.0	0.0	166.0	0.0	0.0	0.0	213.5
Total		50.0	0.0	0.0	47.0	592.0	167.0	0.0	104.1	1,907.8

Ba Dinh	01 Cau Giay									99.0
	02 Cong Vi									136.7
	03 Dien Bien									134.2
	04 Doi Can									38.0
	05 Giang Vo									53.5
	06 Km Ma									76.0
	07 Ngoc Ha									99.2
	08 Phuc Xa									50.0
	09 Quan Thanh									56.0
	10 Thanh Cong									63.6
	11 Truc Bach									38.7
	12 Trung Truc									18.9
	*Military area									39.0
*Ho Chi Minh sq.									13.0	
Total					915.8					915.8

Hoan Kiem	01 Chuong Duoc									30.0
	02 Cua Dong									13.5
	03 Cua Nam									34.2
	04 Dong Xuan									12.6
	05 Hang Bac									22.0
	06 Hang Bai									29.4
	07 Hang Bo									7.5
	08 Hang Bong									14.8
	09 Hang Buom									13.2
	10 Hang Dao									8.0
	11 Hang Dai									12.0
	12 Hang Gai									21.7
	13 Hang Ma									37.6
	14 Hang Trong									27.8
	15 Ly Thai To									53.5
	16 Phan Chu Trinh									36.0
	17 Phuc Tan									36.0
	18 Trang Tien									7.4
Total					417.2					417.2

(ha)

District (Quan)	Commune (Phuong)	Commerc Area	Industrial Area	Institution Area	Mixed Use Area	Resident Area	Village Area	Green & Park Area	Water Area	Total Area
Dong Da	01	Cat Linh								46.2
	02	Hang Bot								27.8
	03	Kham Thien								16.0
	04	Khuong Thuong								35.1
	05	Kim Giang								44.0
	06	Kim Lien								33.9
	07	Lang Ha								80.7
	08	Lang Thuong								123.0
	09	Nam Dong								40.2
	10	Nguyen Trai								42.5
	11	O Cho Dua								84.5
	12	Phuong Liet								65.0
	13	Phuong Lien								34.3
	14	Phuong Mai								43.9
	15	Quang Trun								50.2
	16	Quoc Tu Giam								22.7
	17	Thanh Xuan Bac								146.0
	18	Thanh Xuan Nam								72.0
	19	Thinh Quang								38.3
	20	Tho Quan								24.2
	21	Thuong Dinh								35.8
	22	Trung Liet								91.1
	23	Trung Phung								24.1
	24	Trung Tu								74.3
	25	Van Chuong								43.0
	26	Van Mieu								23.0
		*Bach Mai Airbase								122.8
		Total				1,484.6				1,484.6

Hai Ba Trung	01	Bach Dang								54.4
	02	Bach Khoa								29.0
	03	Bach Mai								29.5
	04	Bui Thi Xu								16.5
	05	Cau Den								24.0
	06	Dong Mac								17.0
	07	Dong Nhan								21.7
	08	Dong Tam								18.8
	09	Giap Bat								64.5
	10	Hoang Van Thu								60.0
	11	Lo Dai Han								83.6
	12	Mai Dong								82.5
	13	Minh Khai								51.0
	14	Ngo Thi Nh								18.1
	15	Nguyen Du								29.3
	16	Pham Dinh Ho								23.5
	17	Pho Hue								20.1
	18	Quynh Loi								29.0
	19	Quynh Mai								37.6
	20	Tan Mai								63.7
	21	Thanh Luong								91.2
	22	Thanh Nhan								58.5
	23	Truong Dinh								30.0
	24	Tuong Mai								45.5
	25	Vinh Tuy(h								109.0
		Total				1,108.0				1,108.0

Total of Urban Area										5,833.4
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(ha)										
District (Huyen)	Commune (Xa)	Commerc Area	Industrial Area	Institution Area	Mixed Use Area	Resident Area	Village Area	Green & Park Area	Water Area	Total Area
Soc Son	01 Bac Phu	0.0	0.0	0.0	0.0	0.0	62.0	0.0	54.0	998.1
	02 Bac Son	0.0	0.0	0.0	0.0	0.0	102.0	0.0	20.0	3,630.6
	03 Dong Xuan	0.0	0.0	0.0	0.0	0.0	118.0	0.0	30.0	646.2
	04 Duc Hoa	0.0	0.0	0.0	0.0	0.0	51.0	0.0	0.0	716.2
	05 Hien Ninh	0.0	0.0	0.0	0.0	0.0	55.0	0.0	61.0	897.1
	06 Hong Ky	0.0	0.0	0.0	0.0	0.0	93.0	0.0	12.0	1,800.0
	07 Kim Lu	0.0	0.0	0.0	0.0	0.0	43.0	0.0	0.0	470.9
	08 Mai Dinh	0.0	250.0	0.0	0.0	84.0	80.0	0.0	0.0	1,375.0
	09 Minh Phu	0.0	0.0	0.0	0.0	0.0	48.0	0.0	0.0	2,181.0
	10 Minh Tri	0.0	0.0	0.0	0.0	0.0	103.0	0.0	0.0	2,435.1
	11 Nam Son	0.0	0.0	0.0	0.0	0.0	26.0	0.0	0.0	2,900.0
	12 Phu Cuong	0.0	0.0	0.0	0.0	0.0	77.0	0.0	0.0	901.7
	13 Phu Linh	0.0	0.0	0.0	0.0	0.0	34.0	0.0	4.0	1,496.0
	14 Phu Lo	0.0	0.0	0.0	0.0	0.0	98.0	0.0	0.0	596.8
	15 Phu Minh(s)	0.0	0.0	0.0	0.0	0.0	84.0	0.0	0.0	743.8
	16 Quang Tien	0.0	180.0	0.0	0.0	0.0	74.0	0.0	151.0	1,469.7
	17 Soc Son To	40.0	0.0	0.0	0.0	146.0	44.5	0.0	37.0	80.0
	18 Tan Dan	0.0	0.0	0.0	0.0	0.0	48.0	0.0	2.0	998.1
	19 Tan Hung	0.0	0.0	0.0	0.0	0.0	44.0	0.0	5.0	899.9
	20 Tan Minh	0.0	0.0	0.0	0.0	0.0	110.0	0.0	80.0	1,072.4
	21 Thanh Xuan	0.0	0.0	0.0	0.0	0.0	89.0	0.0	18.0	726.6
	22 Tien Duc	0.0	0.0	0.0	0.0	305.0	23.0	0.0	12.0	1,426.2
	23 Trung Gia	0.0	0.0	0.0	0.0	0.0	37.0	0.0	0.0	833.3
	24 Viet Long	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	695.4
	25 Xuan Giang	0.0	0.0	0.0	0.0	0.0	54.0	0.0	28.0	835.5
	26 Xuan Thu	0.0	0.0	0.0	0.0	0.0	28.0	0.0	23.0	641.3
Total of Rural Area		0.0	180.0	0.0	0.0	0.0	1,280.0	0.0	458.0	27,342.7
Total of DID		40.0	250.0	0.0	0.0	535.0	363.5	0.0	79.0	4,124.2
Total		40.0	430.0	0.0	0.0	535.0	1,643.5	0.0	537.0	31,466.9

Dong Anh	01 Bac Hong	0.0	0.0	0.0	0.0	0.0	151.0	0.0	56.0	710.0
	02 Co Loa	140.0	0.0	0.0	0.0	0.0	142.0	0.0	24.0	830.0
	03 Dai Mach	0.0	0.0	0.0	0.0	0.0	61.0	0.0	30.0	920.0
	04 Dong Anh T	0.0	0.0	0.0	0.0	0.0	84.0	0.0	0.0	590.0
	05 Dong Hoi	40.0	0.0	0.0	0.0	0.0	45.0	0.0	0.0	720.0
	06 Duc Tu	60.0	0.0	0.0	0.0	0.0	60.0	0.0	0.0	840.0
	07 Hai Boi	0.0	0.0	25.0	0.0	30.0	120.0	0.0	38.0	800.0
	08 Kim Chung	70.0	120.0	0.0	0.0	0.0	110.0	0.0	41.0	690.0
	09 Kim No	0.0	18.0	0.0	0.0	60.0	96.0	0.0	47.0	650.0
	10 Lien Ha	0.0	0.0	0.0	0.0	0.0	61.0	0.0	5.0	870.0
	11 Mai Lam	0.0	0.0	0.0	0.0	0.0	42.0	0.0	12.0	570.0
	12 Nam Hong	0.0	0.0	0.0	0.0	0.0	132.0	0.0	38.0	840.0
	13 Nguyen Khe	50.0	60.0	0.0	0.0	328.0	115.0	0.0	0.0	940.0
	14 Tam Xa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	510.0
	15 Thuy Lam	0.0	0.0	0.0	0.0	0.0	92.0	0.0	0.0	1,000.0
	16 Tien Duong	0.0	0.0	0.0	0.0	0.0	120.0	0.0	38.0	1,070.0
	17 Uy No	0.0	0.0	0.0	0.0	0.0	69.0	0.0	0.0	960.0
	18 Van Ha	0.0	0.0	0.0	0.0	0.0	27.0	0.0	14.0	540.0
	19 Van Noi	0.0	0.0	0.0	0.0	0.0	120.0	0.0	84.0	640.0
	20 Viet Hung	0.0	0.0	0.0	0.0	0.0	104.0	0.0	0.0	830.0
	21 Vinh Ngoc	0.0	0.0	0.0	0.0	0.0	67.0	0.0	26.0	960.0
	22 Vong La	0.0	160.0	0.0	0.0	0.0	58.0	0.0	0.0	730.0
	23 Xuan Canh	0.0	0.0	0.0	0.0	0.0	61.0	0.0	0.0	610.0
	24 Xuan Non	0.0	32.0	0.0	0.0	131.0	63.0	0.0	0.0	1,100.0
Total of Rural Area		0.0	0.0	0.0	0.0	0.0	744.0	0.0	215.0	7,590.0
Total of DID		360.0	390.0	25.0	0.0	549.0	1,246.0	0.0	238.0	11,330.0
Total		360.0	390.0	25.0	0.0	549.0	1,990.0	0.0	453.0	18,920.0

(ha)

District (Huyen)	Commune (Xa)	Commerc Area	Industrial Area	Institution Area	Mixed Use Area	Resident. Area	Village Area	Green & Park Area	Water Area	Total Area
Gia Lam	01 Bat Trang	0.0	0.0	0.0	0.0	0.0	56.0	0.0	0.0	180.0
	02 Bo De	0.0	0.0	0.0	0.0	0.0	38.0	0.0	14.0	310.0
	03 Co Bi	0.0	10.0	0.0	0.0	0.0	32.0	0.0	0.0	430.0
	04 Cu Khoi	0.0	0.0	0.0	0.0	0.0	42.0	0.0	0.0	360.0
	05 Da Ton	0.0	0.0	0.0	0.0	0.0	71.0	0.0	0.0	360.0
	06 Dang Xa	0.0	0.0	0.0	0.0	0.0	87.5	0.0	0.0	570.0
	07 Dinh Xuyen	0.0	0.0	0.0	0.0	0.0	44.0	0.0	0.0	240.0
	08 Dong Du	0.0	0.0	0.0	0.0	0.0	32.0	0.0	0.0	300.0
	09 Duc Giang T	0.0	0.0	0.0	0.0	73.0	38.0	0.0	0.0	210.0
	10 Duong Ha	0.0	80.0	0.0	0.0	114.0	68.0	0.0	0.0	250.0
	11 Duong Quang	0.0	0.0	0.0	0.0	0.0	58.0	0.0	0.0	500.0
	12 Duong Xa	0.0	0.0	0.0	0.0	0.0	78.0	0.0	0.0	350.0
	13 Gia Lam T	20.0	11.0	0.0	0.0	0.0	33.8	0.0	0.0	240.0
	14 Gia Thuy	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	280.0
	15 Giang Bien	24.0	0.0	0.0	0.0	341.0	0.0	0.0	0.0	340.0
	16 Hoi Xa	0.0	363.0	0.0	0.0	76.9	108.0	0.0	0.0	560.0
	17 Kieu Ky	0.0	0.0	0.0	0.0	0.0	68.0	0.0	0.0	340.0
	18 Kim Lan	0.0	0.0	0.0	0.0	0.0	49.0	0.0	0.0	260.0
	19 Kim Son	0.0	0.0	0.0	0.0	0.0	76.2	0.0	0.0	560.0
	20 Le Chi	0.0	0.0	0.0	0.0	0.0	46.1	0.0	0.0	870.0
	21 Long Bien	0.0	0.0	0.0	0.0	0.0	24.5	0.0	3.4	530.0
	22 Ngoc Thuy	0.0	0.0	0.0	0.0	0.0	86.0	0.0	0.0	250.0
	23 Ninh Hiep	0.0	0.0	0.0	0.0	0.0	57.0	0.0	0.0	490.0
	24 Phu Dong	0.0	0.0	0.0	0.0	0.0	88.0	0.0	0.0	1,090.0
	25 Phu Thi	0.0	0.0	0.0	0.0	0.0	49.9	0.0	0.0	440.0
	26 Sai Dong T	0.0	0.0	0.0	0.0	0.0	8.4	0.0	0.0	90.0
	27 Thach Ban	0.0	62.0	0.0	0.0	0.0	132.9	0.0	0.0	460.0
	28 Thuong Thanh	0.0	0.0	0.0	0.0	0.0	94.0	0.0	0.0	360.0
	29 Trau Quy	0.0	0.0	0.0	0.0	0.0	109.0	0.0	0.0	350.0
	30 Trung Mau	0.0	0.0	0.0	0.0	0.0	55.0	0.0	0.0	370.0
	31 Van Duc	0.0	0.0	0.0	0.0	0.0	44.3	0.0	0.0	460.0
	32 Viet Hung	130.0	10.0	0.0	0.0	0.0	21.0	0.0	0.0	390.0
	33 Yen Thuong	0.0	0.0	0.0	0.0	0.0	62.0	0.0	6.8	670.0
	34 Yen Vien	0.0	0.0	0.0	0.0	0.0	70.0	0.0	0.0	260.0
	35 Yen Vien T	0.0	0.0	0.0	0.0	0.0	33.0	0.0	0.0	90.0
Total of Rural Area		0.0	0.0	0.0	0.0	0.0	746.5	0.0	17.4	6,800.0
Total of DID		174.0	536.0	0.0	0.0	604.9	1,208.1	0.0	6.8	7,010.0
Total		174.0	536.0	0.0	0.0	604.9	1,954.6	0.0	24.2	13,810.0

(ha)

District (Huyen)	Commune (Xa)	Commerc Area	Industrial Area	Institution Area	Mixed Use Area	Resident. Area	Village Area	Green & Park Area	Water Area	Total Area
Tu Liem	01 Cau Dien T	0.0	0.0	0.0	0.0	0.0	64.0	0.0	0.0	320.0
	02 Cau Giay T	12.5	0.0	0.0	0.0	69.2	0.0	0.0	0.0	94.4
	03 Co Nhue	6.6	2.2	0.0	0.0	365.0	0.0	0.0	0.0	570.0
	04 Dai Mo	0.0	0.0	0.0	0.0	0.0	42.3	0.0	0.0	470.0
	05 Dich Vong	43.0	0.0	0.0	0.0	205.0	0.0	0.0	0.0	349.1
	06 Dong Ngac	0.0	0.0	0.0	0.0	107.0	0.0	0.0	0.0	366.4
	07 Lien Mac	41.0	220.0	0.0	0.0	48.0	0.0	0.0	0.0	620.0
	08 Mai Dich	16.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	187.9
	09 Me Tri	93.6	0.0	90.0	0.0	58.3	33.8	0.0	0.0	706.6
	10 My Dinh	132.0	0.0	0.0	0.0	114.4	0.0	0.0	0.0	460.6
	11 Nghia Do T	68.0	35.0	0.0	0.0	178.0	0.0	0.0	0.0	180.0
	12 Nghia Tan T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.6
	13 Nhan Chinh	180.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	254.3
	14 Phu Minh T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	15 Phu Thuong	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	16 Tay Mo	0.0	0.0	0.0	0.0	0.0	9.3	0.0	0.0	580.0
	17 Tay Tuu	0.0	0.0	0.0	0.0	0.0	66.4	0.0	0.0	530.0
	18 Thuong Cat	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	380.0
	19 Thuy Phuong	0.0	0.0	0.0	0.0	133.0	0.0	0.0	0.0	250.0
	20 Trung Hoa	0.0	80.0	0.0	34.9	0.0	0.0	0.0	0.0	243.1
	21 Trung Van	30.0	0.0	0.0	49.7	0.0	0.0	0.0	14.8	289.2
	22 Xuan Dinh	0.0	0.0	0.0	0.0	470.0	0.0	0.0	0.0	560.0
	23 Xuan Phuong	0.0	0.0	0.0	0.0	0.0	64.2	0.0	0.0	550.0
	24 Yen Hoa	0.0	0.0	0.0	0.0	208.7	0.0	0.0	0.0	200.0
Total of Rural Area		0.0	0.0	0.0	0.0	0.0	139.9	0.0	0.0	1,660.0
Total of DID		622.7	337.2	90.0	184.6	1,956.6	210.1	0.0	14.8	7,465.2
Total		622.7	337.2	90.0	184.6	1,956.6	350.0	0.0	14.8	9,125.2

(ha)

District (Huyen)	Commune (Xa)	Commerc. Area	Industrial Area	Institution Area	Mixed Use Area	Resident. Area	Village Area	Green & Park Area	Water Area	Total Area
Thanh Tri	01 Dai Ang	0.0	0.0	0.0	0.0	0.0	43.6	0.0	0.0	490.0
	02 Dai Kim	0.0	0.0	0.0	69.2	0.0	0.0	0.0	0.0	250.4
	03 Dinh Cong	0.0	0.0	0.0	0.0	0.0	36.7	0.0	34.7	239.4
	04 Dong My	0.0	0.0	0.0	0.0	0.0	66.9	0.0	0.0	250.0
	05 Duyen Ha	0.0	0.0	0.0	0.0	0.0	48.9	0.0	0.0	340.0
	06 Hoang Liet	0.0	292.0	0.0	84.1	0.0	34.6	0.0	132.1	467.2
	07 Huu Hoa	0.0	0.0	0.0	171.7	0.0	21.8	0.0	27.0	300.0
	08 Khuong Dinh	0.0	0.0	0.0	135.2	0.0	0.0	0.0	135.2	240.4
	09 Lien Minh	0.0	0.0	0.0	0.0	0.0	49.8	0.0	5.1	420.0
	10 Linh Nam	0.0	0.0	0.0	193.2	0.0	31.9	0.0	0.0	552.1
	11 Ngoc Hoi	0.0	0.0	0.0	0.0	0.0	29.6	0.0	0.0	330.0
	12 Ngu Hiep	0.0	0.0	0.0	154.4	0.0	68.5	0.0	19.4	360.0
	13 Ta Thanh O	160.0	0.0	0.0	0.0	0.0	119.9	0.0	0.0	740.0
	14 Tam Hiep	0.0	0.0	0.0	0.0	0.0	82.9	0.0	0.0	343.2
	15 Tan Trieu	0.0	0.0	0.0	184.0	0.0	20.3	0.0	0.0	313.2
	16 Thanh Liet	0.0	0.0	0.0	0.0	0.0	41.0	0.0	0.0	334.2
	17 Thanh Tri	0.0	0.0	0.0	245.1	0.0	0.0	0.0	0.0	260.4
	18 Thinh Liet	0.0	0.0	0.0	182.2	0.0	0.0	0.0	0.0	301.8
	19 Trap Phu	0.0	0.0	0.0	31.0	0.0	12.8	0.0	0.0	357.9
	20 Tu Hiep	0.0	0.0	0.0	234.4	0.0	0.0	0.0	31.6	467.2
	21 Van Dien T	0.0	0.0	0.0	15.6	0.0	0.0	0.0	0.0	69.6
	22 Van Phuc	0.0	0.0	0.0	0.0	0.0	100.3	0.0	0.0	570.0
	23 Vinh Quynh	0.0	0.0	0.0	90.0	0.0	71.9	0.0	0.0	520.0
	24 Vinh Tuy (t)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	180.6
	25 Yen My	0.0	0.0	0.0	0.0	0.0	28.8	0.0	0.0	498.4
	26 Yen So	0.0	0.0	0.0	0.0	0.0	28.8	0.0	182.6	710.7
Total of Rural Area		160.0	0.0	0.0	469.3	0.0	535.4	0.0	187.7	5,603.7
Total of DID		0.0	292.0	0.0	1,340.8	0.0	403.6	0.0	360.0	4,302.0
Total		160.0	292.0	0.0	1,810.1	0.0	939.0	0.0	567.7	9,905.7

Total of Rural Area in Suburban	160.0	180.0	0.0	469.3	0.0	3,445.8	0.0	878.1	48,996.4
Total of DID in Suburban	1,196.7	1,805.2	115.0	1,525.4	3,645.5	3,431.3	0.0	718.6	34,231.4
Total of Whole Suburban	1,356.7	1,985.2	115.0	1,994.7	3,645.5	6,877.1	0.0	1,596.7	83,227.8

Total of Rural Area in Whole City	160.0	180.0	0.0	469.3	0.0	3,445.8	0.0	878.1	48,996.4
Total of DID in Whole City	1,196.7	1,805.2	115.0	1,525.4	3,645.5	3,431.3	0.0	718.6	40,064.8
Total of Whole Hanoi City	1,356.7	1,985.2	115.0	1,994.7	3,645.5	6,877.1	0.0	1,596.7	89,061.2

THE PERCENTAGE OF SCHOOL AGE GROUP

Year	1990	1995	2000	2005	2010
Whole City Population	100% -	100% 2,394,887	100% 2,683,851	100% 2,972,815	100% 3,261,710
<School Age Group>					
Upper Secondary (Age 16-18 / 3 years) No. of School Age	7.7% -	7.4% 177,222	7.0% 187,870	6.7% 199,179	6.5% 212,011
Lower Secondary (Age 12-15 / 4 years) No. of School Age	9.3% -	9.0% 215,540	8.6% 230,811	8.2% 243,771	7.9% 257,675
Primary School (Age 7-11 / 5 years) No. of School Age	13.7% -	13.1% 313,730	12.5% 335,481	11.9% 353,765	11.5% 375,097
Total of School Age No. of School Age	30.7% -	29.5% 706,492	28.1% 754,162	26.8% 796,714	25.9% 844,783

THE PERCENTAGE OF SCHOOL ATTENDANCE

Year	1995	2000	2005	2010
<School Attendance Group>				
Upper Secondary School (Age 16-18 / 3 years) Number of Attendants (Ratio in Whole Population)	30.0% 53,166 (2.2%)	31.0% 58,240 (2.2%)	33.0% 65,729 (2.2%)	35.0% 74,204 (2.3%)
Lower Secondary School (Age 12-15 / 4 years) Number of Attendants (Ratio in Whole Population)	70.0% 150,878 (6.3%)	72.0% 166,184 (6.2%)	74.0% 180,390 (6.1%)	76.0% 195,833 (6.0%)
Primary School School (Age 7-11 / 5 years) Number of Attendants (Ratio in Whole Population)	97.0% 304,318 (12.7%)	98.0% 328,772 (12.3%)	99.0% 350,227 (11.8%)	99.0% 371,346 (11.4%)
Total Percentage of School Attendants Number of Attendants	(21.2%) 508,363	(20.6%) 553,195	(20.1%) 596,347	(19.7%) 641,383

PLANNING STANDARD FOR THE NEIGHBORHOOD FACILITY

Facilities	Persons per Facility	Areas per Facility (m ²)	Facility to be allocated in each administration unit		
			Community	District	City
1. Educational Facilities					
1.1. Kindergarten (1 ~ 2 years)	1,000	300	○	(Included to residential facilities)	
1.2. Elementary School (9 years)	1,800	2,000	●		
1.3. High School (3 years)	2,500	2,500		●	
1.4. College / Academy	200,000	5,000		●	
1.5. University	1,000,000	20,000			○
2. Medical Facilities					
2.1. Clinic, Small Hospital	35,000	300	○	(Included to residential facilities)	
2.2. Hospital (50 beds)	200,000	1,800		●	
2.3. General Hospital (200 beds)	500,000	30,000			○
3. Commercial Facilities					
3.1. Shops / Pharmacy / Eatery	100	100	○	(Included to residential facilities)	
3.2. Small Market / Restaurant	1,500	3,500	●		
3.3. Market / Light Industry	15,000	10,000		●	
3.4. Cinema / Theater	36,000	1,200		●	
3.5. Bank	50,000	500		●	
3.6. Shopping Center	100,000	35,000		●	
3.7. Private Office / Foreign Office	500,000	20,000			○
4. Public Service Facilities					
4.1. Security Post	3,500	180	○	(Included to residential facilities)	
4.2. Post / Telephone Office	35,000	180	} Total 540		
4.3. Local Fire Brigade	35,000	180		●	
4.4. Local Police Station	35,000	180			
4.5. Multipurpose Hall	35,000	500		●	
4.6. Administration Office	35,000	600		●	
4.7. Library	200,000	1,000		●	

NOTE : ● is allocated facilities in the designated DID areas for proposed urban water supply.
Following facilities is excluded in this table such as Religious and Transportation facilities and Play ground, Sports court, Park, Parking and other open air facilities.

ALLOCATION OF NEIGHBORHOOD FACILITY

Area No.	District	Area (ha)	Populat'n 1996	Service Population / Allocated Facilities / Projected Area											
				Year 2000				Year 2005				Year 2010			
				Populat'n	Facilities	Area (ha)	Populat'n	Facilities	Area (ha)	Populat'n	Facilities	Area (ha)	Populat'n	Facilities	Area (ha)
D1	Soc Son	4,124.2	44,177	66,659	Educational Facilities	14.1	89,140	Educational Facilities	18.8	111,620	Educational Facilities	23.6	(Number of School kids) (21,989)		
					(Number of School kids)	(13,752)		(Number of School kids)	(17,917)		(Number of School kids)	(21,989)			
					Medical Facilities	0.0		Medical Facilities	0.0		Medical Facilities	0.0			
					Commercial Facilities	20.0		Commercial Facilities	26.7		Commercial Facilities	37.4			
D2	Don Anh	7,620.0	93,158	152,910	Educational Facilities	32.3	212,662	Educational Facilities	45.4	272,413	Educational Facilities	58.2	(Number of School kids) (53,665)		
					(Number of School kids)	(31,499)		(Number of School kids)	(42,745)		(Number of School kids)	(53,665)			
					Medical Facilities	0.0		Medical Facilities	0.2		Medical Facilities	0.2			
					Commercial Facilities	51.2		Commercial Facilities	71.2		Commercial Facilities	91.3			
D3	Don Anh	3,710.0	38,881	85,329	Educational Facilities	18.0	131,776	Educational Facilities	27.8	178,223	Educational Facilities	37.6	(Number of School kids) (35,110)		
					(Number of School kids)	(17,578)		(Number of School kids)	(26,487)		(Number of School kids)	(35,110)			
					Medical Facilities	0.0		Medical Facilities	0.0		Medical Facilities	0.0			
					Commercial Facilities	25.6		Commercial Facilities	44.1		Commercial Facilities	59.7			
D4	Gia Lam	7,010.0	212,091	275,040	Educational Facilities	58.8	337,993	Educational Facilities	72.2	400,936	Educational Facilities	85.6	(Number of School kids) (78,984)		
					(Number of School kids)	(56,658)		(Number of School kids)	(67,937)		(Number of School kids)	(78,984)			
					Medical Facilities	0.2		Medical Facilities	0.3		Medical Facilities	0.4			
					Commercial Facilities	92.1		Commercial Facilities	113.2		Commercial Facilities	134.3			
D5	Tu Liem	1,746.4	47,753	56,301	Educational Facilities	11.9	64,868	Educational Facilities	13.7	73,433	Educational Facilities	15.5	(Number of School kids) (14,466)		
					(Number of School kids)	(11,598)		(Number of School kids)	(13,038)		(Number of School kids)	(14,466)			
					Medical Facilities	0.0		Medical Facilities	0.0		Medical Facilities	0.0			
					Commercial Facilities	16.9		Commercial Facilities	19.5		Commercial Facilities	22.0			
D6	Tu Liem	2,380.0	37,248	50,235	Educational Facilities	10.6	63,271	Educational Facilities	13.3	76,206	Educational Facilities	16.1	(Number of School kids) (15,013)		
					(Number of School kids)	(10,348)		(Number of School kids)	(12,707)		(Number of School kids)	(15,013)			
					Medical Facilities	0.0		Medical Facilities	0.0		Medical Facilities	0.0			
					Commercial Facilities	15.1		Commercial Facilities	19.0		Commercial Facilities	22.9			
D7	Tanh Tri	2,519.4	69,297	80,446	Educational Facilities	17.0	91,596	Educational Facilities	19.3	102,743	Educational Facilities	21.7	(Number of School kids) (20,240)		
					(Number of School kids)	(16,572)		(Number of School kids)	(18,411)		(Number of School kids)	(20,240)			
					Medical Facilities	0.0		Medical Facilities	0.0		Medical Facilities	0.0			
					Commercial Facilities	24.1		Commercial Facilities	27.5		Commercial Facilities	34.4			
					Public Service Facilities	0.4			Public Service Facilities	0.4		Public Service Facilities	0.5		

ALLOCATION OF NEIGHBORHOOD FACILITY (Detail Consumption)

Area	District	Area (ha)	Service Population / Allocated Facilities/Projected Area															
			1996				Year 2000				Year 2005				Year 2010			
			Population	Facilities	(ha)	Population	Facilities	(ha)	Population	Facilities	(ha)	Population	Facilities	(ha)				
D1	Soc Son	4,124.2	44,177	Elementary School	7.4	89,140	Elementary School	9.9	111,620	Elementary School	12.4							
				High School	6.7		High School	8.9		High School	11.2							
				College / Academy	0.0		College / Academy	0.0		College / Academy	0.0							
				Sub total	14.1		Sub total	18.8		Sub total	23.6							
				No. of School Attendants	13,752		No. of School Attendants	17,917		No. of School Attendants	21,989							
				Hospital	0.0		Hospital	0.0		Hospital	0.0							
				Sub total	0.0		Sub total	0.0		Sub total	0.0							
				Small market/Restaurant	15.6		Small market/Restaurant	20.8		Small market/Restaurant	26.0							
				Market	4.4		Market	5.9		Market	7.4							
				Shopping Center	0.0		Shopping Center	0.0		Shopping Center	3.9							
	Sub total	20.0		Sub total	26.7		Sub total	37.4										
	3 Public offices	0.1		3 Public offices	0.1		3 Public offices	0.2										
	Multipurpose hall	0.1		Multipurpose hall	0.1		Multipurpose hall	0.2										
	Administration office	0.1		Administration office	0.1		Administration office	0.2										
	Library	0.0		Library	0.0		Library	0.0										
	Sub total	0.3		Sub total	0.3		Sub total	0.4										
D2	Don Anh	7,620.0	93,158	Elementary School	17.0	212,662	Elementary School	23.6	272,413	Elementary School	30.3							
				High School	15.3		High School	21.3		High School	27.2							
				College / Academy	0.0		College / Academy	0.5		College / Academy	0.7							
				Sub total	32.3		Sub total	45.4		Sub total	58.2							
				No. of School Attendants	31,499		No. of School Attendants	42,745		No. of School Attendants	53,665							
				Hospital	0.0		Hospital (50 beds)	0.2		Hospital (70 beds)	0.2							
				Sub total	0.0		Sub total	0.2		Sub total	0.2							
				Small market/Restaurant	35.7		Small market/Restaurant	49.6		Small market/Restaurant	63.6							
				Market	10.2		Market	14.2		Market	18.2							
				Shopping Center	5.4		Shopping Center	7.4		Shopping Center	9.5							

D3	Don Anh	3,710.0	38,881	85,329									
					Sub total	51.2	Sub total	71.2	Sub total	91.3			
					3 Public offices	0.2	3 Public offices	0.3	3 Public offices	0.4			
					Multipurpose hall	0.2	Multipurpose hall	0.3	Multipurpose hall	0.4			
					Administration office	0.3	Administration office	0.4	Administration office	0.5			
					Library	0.0	Library	0.1	Library	0.1			
					Sub total	0.7	Sub total	1.1	Sub total	1.4			
					Elementary School	9.5	Elementary School	14.6	Elementary School	19.8			
					High School	8.5	High School	13.2	High School	17.8			
					College / Academy	0.0	College / Academy	0.0	College / Academy	0.0			
					Sub total	18.0	Sub total	27.8	Sub total	37.6			
					No. of School Attendants	17,578	No. of School Attendants	25,487	No. of School Attendants	35,110			
					Hospital	0.0	Hospital	0.0	Hospital	0.0			
					Sub total	0.0	Sub total	0.0	Sub total	0.0			
					Small market/Restaurant	19.9	Small market/Restaurant	30.7	Small market/Restaurant	41.6			
					Market	5.7	Market	8.8	Market	11.9			
					Shopping Center	0.0	Shopping Center	4.6	Shopping Center	6.2			
					Sub total	25.6	Sub total	44.1	Sub total	59.7			
					3 Public offices	0.1	3 Public offices	0.2	3 Public offices	0.3			
					Multipurpose hall	0.1	Multipurpose hall	0.2	Multipurpose hall	0.3			
					Administration office	0.1	Administration office	0.2	Administration office	0.3			
					Library	0.0	Library	0.0	Library	0.0			
					Sub total	0.4	Sub total	0.6	Sub total	0.8			
D4	Gia Lam	7,010.0	212,091	275,040									
					Elementary School	30.6	Elementary School	37.6	Elementary School	44.5			
					High School	27.5	High School	33.8	High School	40.1			
					College / Academy	0.7	College / Academy	0.8	College / Academy	1.0			
					Sub total	58.8	Sub total	72.2	Sub total	85.6			
					No. of School Attendants	56,658	No. of School Attendants	67,937	No. of School Attendants	78,984			
					Hospital (50 beds)	0.2	Hospital (85 beds)	0.3	Hospital (100beds)	0.4			
					Sub total	0.2	Sub total	0.3	Sub total	0.4			
					Small market/Restaurant	64.2	Small market/Restaurant	78.9	Small market/Restaurant	93.6			
					Market	18.3	Market	22.5	Market	26.7			

							Shopping Center								Shopping Center			
			Sub total	9.6			Sub total	11.8				Sub total	14.0					
			3 Public offices	0.4			3 Public offices	0.5				3 Public offices	0.6					
			Multipurpose hall	0.4			Multipurpose hall	0.5				Multipurpose hall	0.6					
			Administration office	0.5			Administration office	0.6				Administration office	0.7					
			Library	0.1			Library	0.2				Library	0.2					
			Sub total	1.4			Sub total	1.8				Sub total	2.1					
			Elementary School	6.3			Elementary School	7.2				Elementary School	8.2					
			High School	5.6			High School	6.5				High School	7.3					
			College / Academy	0.0			College / Academy	0.0				College / Academy	0.0					
			Sub total	11.9			Sub total	13.7				Sub total	15.5					
			No. of School Attendants	11,598			No. of School Attendants	15,038				No. of School Attendants	14,466					
			Hospital	0.0			Hospital	0.0				Hospital	0.0					
			Sub total	0.0			Sub total	0.0				Sub total	0.0					
			Small market/Restaurant	13.1			Small market/Restaurant	15.1				Small market/Restaurant	17.1					
			Market	3.8			Market	4.3				Market	4.9					
			Shopping Center	0.0			Shopping Center	0.0				Shopping Center	0.0					
			Sub total	16.9			Sub total	19.5				Sub total	22.0					
			3 Public offices	0.1			3 Public offices	0.1				3 Public offices	0.1					
			Multipurpose hall	0.1			Multipurpose hall	0.1				Multipurpose hall	0.1					
			Administration office	0.1			Administration office	0.1				Administration office	0.1					
			Library	0.0			Library	0.0				Library	0.0					
			Sub total	0.3			Sub total	0.3				Sub total	0.3					
			Elementary School	5.6			Elementary School	7.0				Elementary School	8.5					
			High School	5.0			High School	6.3				High School	7.6					
			College / Academy	0.0			College / Academy	0.0				College / Academy	0.0					
			Sub total	10.6			Sub total	13.3				Sub total	16.1					
			No. of School Attendants	10,348			No. of School Attendants	12,707				No. of School Attendants	15,013					
			Hospital	0.0			Hospital	0.0				Hospital	0.0					
			Sub total	0.0			Sub total	0.0				Sub total	0.0					
			Small market/Restaurant	11.7			Small market/Restaurant	14.8				Small market/Restaurant	17.8					
D5	Tu Liem	1,746.4	47,733	56,301			64,868	73,433				73,433						
D6	Tu Liem	2,380.0	37,248	50,235			63,221	76,206				76,206						

D7	Tanh Tri	2,519.4	69,297	80,446	Market	3.3	Market	4.2	Market	5.1
					Shopping Center	0.0	Shopping Center	0.0	Shopping Center	0.0
					Sub total	15.1	Sub total	19.0	Sub total	22.9
					3 Public offices	0.1	3 Public offices	0.1	3 Public offices	0.1
					Multipurpose hall	0.1	Multipurpose hall	0.1	Multipurpose hall	0.1
					Administration office	0.1	Administration office	0.1	Administration office	0.1
					Library	0.0	Library	0.0	Library	0.0
					Sub total	0.2	Sub total	0.3	Sub total	0.4
					Elementary School	8.9	Elementary School	10.2	Elementary School	11.4
					High School	8.0	High School	9.2	High School	10.3
					College / Academy	0.0	College / Academy	0.0	College / Academy	0.0
					Sub total	17.0	Sub total	19.3	Sub total	21.7
					No. of School Attendants	16,572	No. of School Attendants	18,411	No. of School Attendants	20,240
					Hospital	0.0	Hospital	0.0	Hospital	0.0
					Sub total	0.0	Sub total	0.0	Sub total	0.0
Small market/Restaurant	18.8	Small market/Restaurant	21.4	Small market/Restaurant	24.0					
Market	5.4	Market	6.1	Market	6.8					
Shopping Center	0.0	Shopping Center	0.0	Shopping Center	3.6					
Sub total	24.1	Sub total	27.5	Sub total	34.4					
3 Public offices	0.1	3 Public offices	0.1	3 Public offices	0.2					
Multipurpose hall	0.1	Multipurpose hall	0.1	Multipurpose hall	0.1					
Administration office	0.1	Administration office	0.2	Administration office	0.2					
Library	0.0	Library	0.0	Library	0.0					
Sub total	0.4	Sub total	0.4	Sub total	0.5					

APPENDIX B-2 Population Forecast

POPULATION FORECAST : SUMMARY

District (Quan / Huyen)	Area (ha)	Present			Forecast					
		Population in 1995	Density (p/ha)	Population in 2000	Density (p/ha)	Population in 2005	Density (p/ha)	Population in 2010	Density (p/ha)	
Tay Ho	1,907.8	80,638	42.3	115,451	60.5	150,265	78.8	185,075	97.0	
Ba Dinh	915.8	191,286	208.9	191,848	209.5	192,411	210.1	192,968	210.7	
Hoan Kiem	417.2	193,504	463.8	173,556	416.0	153,606	368.2	133,553	320.4	
Dong Da	1,484.6	391,686	263.8	403,851	272.0	416,016	280.2	428,173	288.4	
Hai Ba Trung	1,108.0	347,289	313.4	337,044	304.2	326,800	294.9	316,548	285.7	
Total of Urban Area	5,833.4	1,204,403	206.5	1,221,750	209.4	1,239,098	212.4	1,256,417	215.4	
(Growth rate per year)				(0.29%)		(0.28%)		(0.28%)		
Soc Son	31,466.9	211,186	6.7	252,349	8.0	293,511	9.3	334,667	10.6	
Dong Anh	18,920.0	221,229	11.7	329,806	17.4	438,383	23.2	546,955	28.9	
Gia Lam	13,810.0	302,566	21.9	364,760	26.4	426,956	30.9	489,139	35.4	
Tu Liem	9,125.2	241,848	26.5	287,439	31.5	333,027	36.5	378,506	41.5	
Thanh Tri	9,905.7	213,655	21.6	227,747	23.0	241,840	24.4	255,926	25.8	
Total of Suburban	83,227.8	1,190,484	14.3	1,462,101	17.6	1,733,717	20.8	2,005,293	24.1	
(Growth rate per year)				(4.20%)		(3.47%)		(2.95%)		
Total of Whole City	89,061.2	2,394,887	26.9	2,663,851	30.1	2,972,815	33.4	3,261,710	36.6	
(Growth rate per year)				(2.30%)		(2.07%)		(1.87%)		

POPULATION FORECAST BY COMMUNE

District (Quan, Huyen)	Commune (Phuong,Xa)	Area (ha)	Existing		Forecast					
			Population in 1995	Density 95(p/ha)	Population in 2000	Density 00(p/ha)	Population in 2005	Density 05(p/ha)	Population in 2010	Density 10(p/ha)
Tay Ho	01 Buoï	106.0	16,612	156.7	17,453	164.7	18,306	172.7	19,153	180.7
	02 Thuy Khue	51.5	14,352	278.7	13,864	269.2	13,376	259.7	12,887	250.2
	03 Yen Phu	95.5	16,226	169.9	17,170	179.8	18,113	189.7	19,057	199.5
	04 Nhat Tan	299.6	5,695	19.0	14,771	49.3	23,848	79.6	32,924	109.9
	05 Phu Thuong	609.5	8,524	14.0	21,140	34.7	33,766	55.4	46,371	76.1
	06 Quang An	188.2	5,397	28.7	5,715	30.4	6,034	32.1	6,352	33.8
	07 Tu Lien	344.0	6,832	19.9	8,630	25.1	10,428	30.3	12,225	35.5
	08 Xuan La	213.5	7,000	32.8	16,702	78.2	26,404	123.7	36,106	169.1
Total		1,907.8	80,638	42.3	115,451	60.5	150,265	78.8	185,075	97.0

Ba Dinh	01 Cau Giay	99.0	18,067	182.5	18,300	184.9	18,534	187.2	18,767	189.6
	02 Cong Vi	136.7	22,379	163.7	23,534	172.2	24,690	180.6	25,845	189.1
	03 Dien Bien	134.2	12,508	93.2	12,381	92.3	12,254	91.3	12,127	90.4
	04 Doi Can	38.0	14,875	391.4	14,156	372.5	13,438	353.6	12,719	334.7
	05 Giang Vo	53.5	16,565	309.6	15,924	297.6	15,283	285.7	14,641	273.7
	06 Kim Ma	76.0	15,681	206.3	14,961	196.9	14,241	187.4	13,520	177.9
	07 Ngoc Ha	99.2	15,869	160.0	16,777	169.1	17,685	178.3	18,592	187.4
	08 Phuc Xa	50.0	14,112	282.2	14,584	291.7	15,056	301.1	15,528	310.6
	09 Quan Thanh	56.0	12,853	229.5	12,016	214.5	11,177	199.6	10,338	184.6
	10 Thanh Cong	63.6	18,966	298.2	19,975	314.1	20,983	329.9	21,992	345.8
	11 Truc Bach	38.7	14,138	365.3	14,354	370.9	14,569	376.5	14,785	382.0
	12 Trung Truc	18.9	11,545	610.8	11,159	590.4	10,773	570.0	10,386	549.5
		*Military area	39.0	3,728	95.6	3,728	95.6	3,728	95.6	3,728
	*Ho Chi Minh sq	13.0	0	0.0	0	0.0	0	0.0	0	0.0
Total		915.8	191,286	208.9	191,848	209.5	192,411	210.1	192,968	210.7

Hoan Kiem	01 Chuong Duoc	30.0	14,151	471.7	12,363	412.1	10,576	352.5	8,788	292.9
	02 Cua Dong	13.5	10,706	793.0	9,280	687.4	7,853	581.7	6,427	476.0
	03 Cua Nam	34.2	14,150	413.7	12,863	376.1	11,575	338.5	10,288	300.8
	04 Dong Xuan	12.6	13,607	1,079.9	11,205	889.3	8,804	698.7	6,402	508.1
	05 Hang Bac	22.0	8,844	402.0	8,393	381.0	7,922	360.1	7,461	339.1
	06 Hang Bai	29.4	10,474	356.3	9,606	326.7	8,737	297.2	7,869	267.6
	07 Hang Bo	7.5	10,564	1,408.5	8,423	1,123.1	6,282	837.6	4,141	552.1
	08 Hang Bong	14.8	9,368	633.0	7,901	533.9	6,434	434.7	4,967	335.6
	09 Hang Buom	13.2	12,773	967.7	11,080	839.4	9,387	711.1	7,693	582.8
	10 Hang Dao	8.0	8,590	1,073.8	7,193	899.1	5,795	724.4	4,398	549.7
	11 Hang Gai	12.0	11,761	980.1	10,071	839.2	8,381	698.4	6,690	557.5
	12 Hang Ma	21.7	9,832	453.1	8,999	414.7	8,166	376.3	7,333	337.9
	13 Hang Trong	37.6	9,628	256.1	9,646	256.5	9,664	257.0	9,682	257.5
	14 Ly Thai To	27.8	9,346	336.2	8,760	315.1	8,173	294.0	7,587	272.9
	15 Phan Chu Trinh	53.5	9,229	172.5	9,422	176.1	9,615	179.7	9,807	183.3
	16 Phuc Tan	36.0	10,971	304.8	10,728	298.0	10,486	291.3	10,243	284.5
	17 Tran Hung Duc	36.0	12,005	333.5	11,254	312.6	10,603	291.7	9,751	270.9
	18 Trang Tien	7.4	7,505	1,014.2	6,379	862.0	5,253	709.8	4,126	557.6
Total		417.2	193,504	463.8	173,556	416.0	153,606	368.2	133,653	320.4

Dong Da	01	Cat Linh	46.2	15,444	334.3	16,083	348.1	16,722	361.9	17,361	375.8
	02	Hang Bot	27.8	16,255	584.7	16,316	586.9	16,378	589.1	16,439	591.3
	03	Kham Thien	16.0	10,836	677.3	10,127	632.9	9,418	588.6	8,709	544.3
	04	Khuong Thuong	35.1	11,996	341.8	12,247	348.9	12,498	356.1	12,749	363.2
	05	Kim Giang	44.0	8,357	189.9	10,018	227.7	11,679	265.4	13,339	303.2
	06	Kim Lien	33.9	13,454	396.9	14,091	415.6	14,727	434.4	15,364	453.2
	07	Lang Ha	80.7	14,493	179.6	15,504	192.1	16,515	204.6	17,526	217.2
	08	Lang Thuong	123.0	13,679	111.2	15,259	124.1	16,840	136.9	18,420	149.8
	09	Nam Dong	40.2	16,239	404.0	16,929	421.1	17,620	438.3	18,310	455.5
	10	Nguyen Trai	42.5	28,389	668.0	27,042	636.3	25,695	604.6	24,347	572.9
	11	O Cho Dua	84.5	20,133	238.3	20,350	240.8	20,567	243.4	20,783	246.0
	12	Phuong Liet	65.0	13,354	205.4	13,516	207.9	13,677	210.4	13,839	212.9
	13	Phuong Lien	34.3	13,473	392.8	13,605	396.6	13,737	400.5	13,868	404.3
	14	Phuong Mai	43.9	13,904	316.7	14,928	340.0	15,952	363.4	16,976	386.7
	15	Quang Trun	50.2	9,812	195.5	10,609	211.3	11,406	227.2	12,203	243.1
	16	Quoc Tu Giam	22.7	8,917	392.8	9,563	421.3	10,209	449.7	10,854	478.2
	17	Thanh Xuan Bac	146.0	10,854	74.3	15,641	107.1	20,427	139.9	25,214	172.7
	18	Thanh Xuan Nam	72.0	26,858	400.8	29,144	404.8	29,429	408.7	29,715	412.7
	19	Thinh Quang	38.3	15,856	414.0	15,892	414.9	15,928	415.9	15,964	416.8
	20	Tho Quan	24.2	14,568	602.0	14,051	580.6	13,534	559.3	13,017	537.9
	21	Thuong Dinh	35.8	11,920	333.0	12,888	360.0	13,857	397.1	14,825	414.1
	22	Trung Liet	91.1	14,870	163.2	15,903	174.6	16,935	185.9	17,968	197.2
	23	Trung Phung	24.1	13,113	544.1	12,335	511.8	11,557	479.5	10,778	447.2
	24	Trung Tu	74.3	14,069	189.4	15,052	202.6	16,035	215.8	17,017	229.0
	25	Van Chuong	43.0	15,427	358.8	14,465	336.4	13,503	314.0	12,540	291.6
	26	Van Mieu	23.0	13,095	569.3	11,972	520.5	10,850	471.7	9,727	422.9
		Bach Mai Airbus	122.8	10,321	84.0	10,321	84.0	10,321	84.0	10,321	84.0
		Total	1,484.6	391,686	263.8	403,851	272.0	416,016	280.2	428,173	288.4

Hai Ba Trung	01	Bach Dang	54.4	16,665	306.3	13,787	253.4	10,910	200.5	8,032	147.6
	02	Bach Khoa	29.0	11,592	399.7	12,444	429.1	13,296	458.5	14,148	487.9
	03	Bach Mai	29.5	16,576	561.9	16,182	548.5	15,788	535.2	15,394	521.8
	04	Bui Thi Xu	16.5	11,682	708.0	10,762	652.2	9,841	596.4	8,921	540.6
	05	Cau Den	24.0	12,512	521.3	11,261	469.2	10,010	417.1	8,758	364.9
	06	Dong Mac	17.0	9,570	562.9	8,866	521.5	8,162	480.1	7,458	438.7
	07	Dong Nhan	21.7	11,416	526.1	10,735	494.7	10,054	463.3	9,373	431.9
	08	Dong Tam	18.8	14,446	768.4	13,085	696.0	11,723	623.6	10,362	551.1
	09	Giap Bat	64.5	10,604	164.4	11,453	177.6	12,302	190.7	13,151	203.9
	10	Hoang Van Thu	60.0	8,675	144.6	9,006	150.1	9,338	155.6	9,669	161.1
	11	Le Dai Han	83.6	15,365	183.8	14,024	167.7	12,683	151.7	11,341	135.7
	12	Mai Dong	82.5	12,428	150.6	12,571	152.4	12,714	154.1	12,857	155.8
	13	Minh Khai	51.0	14,492	284.2	14,619	286.6	14,746	289.1	14,873	291.6
	14	Ngo Thi Nh	18.1	12,837	709.2	11,753	649.3	10,669	589.4	9,584	529.5
	15	Nguyen Du	29.3	11,019	376.1	10,264	350.3	9,510	324.6	8,755	298.8
	16	Pham Dinh Ho	23.5	10,158	432.3	9,119	388.0	8,079	343.8	7,040	299.6
	17	Pho Hue	20.1	15,461	769.2	13,971	695.1	12,481	620.9	10,990	546.8
	18	Quynh Loi	29.0	12,375	426.7	12,539	432.4	12,703	438.0	12,867	443.7
	19	Quynh Mai	37.6	13,088	348.1	11,829	314.6	10,571	281.1	9,312	247.7
	20	Tan Mai	63.7	17,704	277.9	18,028	283.0	18,352	288.1	18,676	293.2
	21	Thanh Luong	91.2	14,815	162.4	15,388	168.7	15,962	175.0	16,535	181.3
	22	Thanh Nhan	58.5	18,554	317.2	18,916	323.3	19,277	329.5	19,639	335.7
	23	Truong Dinh	30.0	17,145	571.5	16,859	562.0	16,573	552.4	16,286	542.9
	24	Tuong Mai	45.5	17,793	391.1	18,595	408.7	19,397	426.3	20,198	443.9
	25	Vinh Tuy(h	109.0	20,317	186.4	20,988	192.5	21,659	198.7	22,329	204.9
		Total	1,108.0	347,289	313.4	337,044	304.2	326,800	294.9	316,548	285.7

Total of Urban Area	5,833.4	1,204,403	206.5	1,221,750	209.4	1,239,098	212.4	1,256,417	215.4
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Soc Son	01	Bac Phu	998.1	7,671	7.7	9,003	9.0	10,336	10.4	11,668	11.7
	02	Bac Son	3,630.6	10,844	3.0	12,133	3.3	13,422	3.7	14,711	4.1
	03	Dong Xuan	648.2	8,642	13.4	8,882	13.7	9,121	14.1	9,361	14.5
	04	Duc Hoa	716.2	6,106	8.5	6,830	9.5	7,553	10.5	8,277	11.6
	05	Hien Ninh	897.1	8,114	9.0	9,086	10.1	10,057	11.2	11,029	12.3
	06	Hong Ky	1,800.0	8,199	4.6	9,399	5.2	10,600	5.9	11,800	6.6
	07	Kim Lu	470.9	6,875	14.6	7,656	16.3	8,438	17.9	9,219	19.6
	08	Mai Dinh	1,375.0	12,430	9.0	20,823	15.1	29,215	21.2	37,608	27.4
	09	Minh Phu	2,181.0	8,376	3.8	9,032	4.1	9,688	4.4	10,344	4.7
	10	Minh Tri	2,435.1	10,149	4.2	10,612	4.4	11,075	4.5	11,537	4.7
	11	Nam Son	2,900.0	6,679	2.3	7,259	2.5	7,840	2.7	8,420	2.9
	12	Phu Cuong	901.7	7,423	8.2	8,267	9.2	9,112	10.1	9,956	11.0
	13	Phu Linh	1,495.0	6,706	4.5	7,530	5.0	8,353	5.6	9,177	6.1
	14	Phu Lo	596.8	10,657	18.2	11,893	19.9	12,929	21.7	13,964	23.4
	15	Phu Minh(s)	743.8	6,948	9.3	7,336	9.9	7,724	10.4	8,112	10.9
	16	Quang Tien	1,469.7	6,066	4.1	8,655	5.9	11,244	7.7	13,832	9.4
	17	Soc Son To	80.0	2,497	31.2	4,248	53.1	6,999	75.0	7,749	96.9
	18	Tan Dan	998.1	8,801	8.8	9,351	9.4	9,901	9.9	10,450	10.5
	19	Tan Hung	899.9	8,230	9.1	9,423	10.5	10,615	11.8	11,808	13.1
	20	Tan Minh	1,072.4	10,381	9.7	10,536	9.8	10,691	10.0	10,846	10.1
	21	Thanh Xuan	726.6	9,173	12.6	9,880	13.6	10,587	14.6	11,293	15.5
	22	Tien Duc	1,426.2	9,751	6.8	20,813	14.6	31,876	22.3	42,938	30.1
	23	Trung Gia	833.3	9,861	11.8	10,645	12.8	11,431	13.7	12,215	14.7
	24	Viet Long	695.4	6,055	8.7	6,791	9.8	7,528	10.8	8,264	11.9
	25	Xuan Giang	835.5	7,270	8.7	8,203	9.8	9,135	10.9	10,068	12.0
	26	Xuan Thu	641.3	7,082	11.0	8,062	12.6	9,041	14.1	10,021	15.6
Total of Rural Area			27,342.7	167,009	6.1	185,690	6.8	204,371	7.5	223,047	8.2
Total of DID			4,124.2	44,177	10.7	66,659	16.2	89,140	21.6	111,620	27.1
									(33.35%)		
Total			31,466.9	211,186	6.7	252,349	8.0	293,511	9.3	334,667	10.6

Dong Anh	01	Bac Hong	710.0	9,294	13.1	9,963	14.0	10,631	15.0	11,300	15.9
	02	Co Loa	830.0	12,835	15.5	21,698	26.1	30,560	36.8	39,423	47.6
	03	Dai Mach	920.0	7,457	8.1	7,593	8.3	7,729	8.4	7,864	8.5
	04	Dong Anh T	690.0	20,855	35.3	24,160	40.9	27,466	46.6	30,771	52.2
	05	Dong Hol	720.0	8,065	11.2	13,599	18.9	19,134	26.6	24,668	34.3
	06	Duc Tu	840.0	12,089	14.4	19,840	23.6	27,591	32.8	35,342	42.1
	07	Hai Boi	800.0	9,874	12.3	19,183	24.0	28,491	35.6	37,800	47.2
	08	Kim Chung	690.0	6,873	10.0	22,036	31.9	37,199	53.9	52,361	75.9
	09	Kim No	650.0	8,078	12.4	16,474	25.3	24,871	38.3	33,267	51.2
	10	Lien Ha	870.0	11,711	13.5	11,783	13.5	11,856	13.6	11,928	13.7
	11	Mai Lam	570.0	8,134	14.3	9,486	16.6	10,837	19.0	12,189	21.4
	12	Nam Hong	840.0	8,830	10.6	20,671	24.6	32,312	38.5	44,063	52.4
	13	Nguyen Kho	940.0	9,550	10.2	19,229	20.5	28,908	30.8	38,586	41.0
	14	Tam Xa	510.0	3,580	7.0	4,210	8.3	4,839	9.5	5,469	10.7
	15	Thuy Lam	1,000.0	13,480	13.5	13,610	13.6	13,740	13.7	13,870	13.9
	16	Tien Duong	1,070.0	1,412	1.3	12,657	11.7	23,702	22.2	34,847	32.6
	17	Uy No	960.0	10,807	11.3	16,497	17.2	22,166	23.1	27,876	29.0
	18	Van Ha	540.0	6,979	12.9	6,984	12.9	6,990	12.9	6,995	13.0
	19	Van Noi	640.0	7,977	12.5	7,983	12.5	7,989	12.5	7,994	12.5
	20	Viet Hung	830.0	11,565	13.9	11,674	14.1	11,783	14.2	11,891	14.3
	21	Vinh Ngoc	960.0	8,915	9.3	8,936	9.3	8,958	9.3	8,979	9.4
	22	Vong La	730.0	6,226	7.2	7,065	9.7	8,903	12.2	10,742	14.7
	23	Xuan Canh	610.0	8,232	13.5	8,831	14.5	9,430	15.5	10,029	16.4
	24	Xuan Non	1,100.0	9,411	8.6	15,844	14.4	22,278	20.3	28,711	26.1
Total of Rural Area			7,590.0	89,190	11.8	91,567	12.1	93,945	12.4	96,319	12.7
Total of DID			11,330.0	132,039	11.7	238,239	21.0	344,438	30.4	450,636	39.8
									(82.39%)		
Total			18,920.0	221,229	11.7	329,806	17.4	438,383	23.2	546,955	28.9

Gia Lam	01	Bat Trang	180.0	5,425	30.1	5,243	29.1	5,060	28.1	4,878	27.1
	02	Bo De	310.0	5,597	18.1	5,409	17.4	5,221	16.8	5,032	16.2
	03	Co Bi	430.0	7,074	16.5	9,397	21.9	11,720	27.3	14,042	32.7
	04	Cu Khoi	360.0	4,948	13.7	4,782	13.3	4,615	12.8	4,449	12.4
	05	Da Ton	360.0	8,917	24.8	8,938	24.8	8,959	24.9	8,979	24.9
	06	Dang Xa	570.0	7,163	12.6	7,247	12.7	7,332	12.9	7,416	13.0
	07	Dinh Xuyen	240.0	6,684	27.9	6,763	28.2	6,842	28.5	6,921	28.8
	08	Dong Du	300.0	3,436	11.5	3,321	11.1	3,205	10.7	3,090	10.3
	09	Duc Giang T	210.0	21,056	100.3	23,292	110.9	25,528	121.6	27,764	132.2
	10	Duong Ha	250.0	4,389	17.6	4,241	17.0	4,094	16.4	3,946	15.8
	11	Duong Quang	500.0	8,389	16.8	8,417	16.8	8,445	16.9	8,472	16.9
	12	Duong Xa	350.0	7,434	21.2	7,576	21.6	7,717	22.0	7,859	22.5
	13	Gia Lam T	240.0	27,385	114.1	27,414	114.2	27,443	114.3	27,471	114.5
	14	Gia Thuy	280.0	6,468	23.1	14,851	53.0	23,234	83.0	31,617	112.9
	15	Giang Bien	340.0	4,260	12.5	7,548	22.2	10,837	31.9	14,125	41.5
	16	Hoi Xa	560.0	7,289	13.0	12,967	23.2	18,645	33.3	24,322	43.4
	17	Kieu Ky	340.0	7,668	22.6	7,751	22.8	7,834	23.0	7,917	23.3
	18	Kim Lan	260.0	4,309	16.6	4,164	16.0	4,019	15.5	3,874	14.9
	19	Kim Son	560.0	9,293	16.6	9,345	16.7	9,397	16.8	9,448	16.9
	20	Le Chi	870.0	8,496	9.8	8,622	9.9	8,748	10.1	8,874	10.2
	21	Long Bien	530.0	7,289	13.8	7,044	13.3	6,799	12.8	6,553	12.4
	22	Ngoc Thuy	250.0	12,851	51.4	20,888	83.6	28,926	115.7	36,963	147.9
	23	Ninh Hiep	490.0	11,635	23.7	11,651	23.8	11,668	23.8	11,684	23.8
	24	Phu Dong	1,090.0	10,126	9.3	10,220	9.4	10,313	9.5	10,407	9.5
	25	Phu Thi	440.0	5,773	13.1	5,830	13.2	5,887	13.4	5,943	13.5
	26	Sai Dong T	90.0	9,926	110.3	13,474	149.7	17,022	189.1	20,570	228.6
	27	Thach Ban	460.0	9,278	20.2	11,271	24.5	13,264	28.8	15,257	33.2
	28	Thuong Thanh	360.0	8,424	23.4	22,498	62.5	36,572	101.6	50,645	140.7
	29	Trau Quy	350.0	10,027	28.6	10,270	29.3	10,514	30.0	10,757	30.7
	30	Trung Mau	370.0	4,323	11.7	4,367	11.8	4,412	11.9	4,456	12.0
	31	Van Duc	460.0	5,908	12.8	5,709	12.4	5,510	12.0	5,311	11.5
	32	Viet Hung	390.0	12,056	30.9	22,384	57.4	32,712	83.9	43,040	110.4
	33	Yen Thuong	670.0	10,083	15.0	12,600	18.8	15,118	22.6	17,635	26.3
	34	Yen Vien	260.0	8,302	31.9	8,352	32.1	8,401	32.3	8,451	32.5
	35	Yen Vien T	90.0	10,885	120.9	10,914	121.3	10,943	121.6	10,971	121.9
Total of Rural Area			6,800.0	90,475	13.3	89,720	13.2	88,963	13.1	88,203	13.0
Total of DiD			7,010.0	212,091	30.3	275,040	39.2	337,993	48.2	400,936	57.2
										(81.97%)	
Total			13,810.0	302,566	21.9	364,760	26.4	426,956	30.9	489,139	35.4

Tu Liem	01	Cau Dien T	320.0	15,910	49.7	17,183	53.7	18,455	57.7	19,728	61.6
	02	Cau Giay T	94.4	13,129	139.1	14,847	157.3	16,565	175.5	18,282	193.7
	03	Co Nhue	570.0	12,437	21.8	14,078	24.7	15,719	27.6	17,359	30.5
	04	Dai Mo	470.0	10,717	22.8	10,788	23.0	10,859	23.1	10,929	23.3
	05	Dich Vong	349.1	8,340	23.9	13,765	39.4	19,170	54.9	24,585	70.4
	06	Dong Ngac	366.4	17,982	49.1	19,737	53.9	21,491	58.7	23,246	63.4
	07	Lien Mac	620.0	5,862	9.5	11,445	18.5	17,027	27.5	22,610	36.5
	08	Mai Dich	187.9	13,493	71.8	13,870	73.8	14,247	75.8	14,623	77.8
	09	Mo Tri	706.6	12,645	17.9	15,734	22.3	18,823	26.6	21,911	31.0
	10	My Dinh	460.6	7,357	16.0	8,768	19.0	10,179	22.1	11,589	25.2
	11	Nghia Do T	180.0	11,744	65.2	18,058	100.3	24,372	135.4	30,686	170.5
	12	Nghia Tan T	53.6	14,948	278.9	14,961	279.1	14,974	279.4	14,987	279.6
	13	Nhan Chinh	254.3	8,865	34.9	8,899	35.0	8,933	35.1	8,966	35.3
	14	Phu Minh T	910.0	15,453	17.0	19,090	21.0	22,727	25.0	26,363	29.0
	15	Phu Thuong	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	16	Tay Mo	580.0	8,951	15.4	9,213	15.9	9,476	16.3	9,738	16.8
	17	Tay Tuu	530.0	10,866	20.5	10,900	20.6	10,933	20.6	10,967	20.7
	18	Thuong Cat	380.0	5,216	13.7	8,912	23.5	12,608	33.2	16,304	42.9
	19	Thuy Phuong	250.0	5,945	23.8	6,459	25.8	6,973	27.9	7,486	29.9
	20	Trung Hoa	243.1	5,977	24.6	5,983	24.6	5,989	24.6	5,994	24.7
	21	Trung Van	289.2	7,823	27.1	8,867	30.7	9,912	34.3	10,956	37.9
	22	Xuan Dinh	550.0	11,369	20.3	16,027	28.6	20,685	36.9	25,342	45.3
	23	Xuan Phuan	550.0	8,918	16.2	8,939	16.3	8,959	16.3	8,980	16.3
	24	Yen Hoa	200.0	7,901	39.5	10,926	54.6	13,951	69.8	16,975	84.9
Total of Rural Area		1,660.0	28,735	17.3	29,052	17.5	29,368	17.7	29,685	17.9	
Total of DID		7,465.2	213,113	28.5	258,387	34.6	303,659	40.7	348,921	46.7	
									(92.16%)		
Total		9,125.2	241,848	26.5	287,439	31.5	333,027	36.5	378,606	41.5	

Thanh Tri	01	Dai Ang	490.0	6,599	13.5	6,699	13.7	6,800	13.9	6,900	14.1
	02	Dai Kim	250.4	6,065	24.2	6,549	26.2	7,033	28.1	7,516	30.0
	03	Dinh Cong	239.4	6,400	26.7	8,050	33.6	9,700	40.5	11,350	47.4
	04	Dong My	250.0	6,008	20.0	5,131	20.5	5,254	21.0	5,377	21.5
	05	Duyen Ha	340.0	4,249	12.5	4,312	12.7	4,375	12.9	4,437	13.1
	06	Hoang Liet	467.2	8,370	17.9	9,028	19.3	9,685	20.7	10,343	22.1
	07	Huu Hoa	300.0	6,533	21.8	13,622	45.4	20,712	69.0	27,801	92.7
	08	Khuong Dinh	240.4	7,201	30.0	8,901	37.0	10,601	44.1	12,300	51.2
	09	Lien Minh	420.0	6,490	15.5	6,618	15.8	6,745	16.1	6,873	16.4
	10	Linh Nam	552.1	10,552	19.1	8,664	15.7	6,776	12.3	4,888	8.9
	11	Ngoc Hoi	330.0	6,408	19.4	6,431	19.5	6,454	19.6	6,477	19.6
	12	Ngoc Hiep	360.0	7,859	21.8	7,894	21.9	7,930	22.0	7,965	22.1
	13	Ta Thanh O	740.0	11,705	15.8	11,779	15.9	11,853	16.0	11,926	16.1
	14	Tam Hiep	343.2	8,707	25.4	8,780	25.6	8,854	25.8	8,927	26.0
	15	Tan Trieu	313.2	9,982	31.9	11,737	37.5	13,491	43.1	15,246	48.7
	16	Thanh Liet	334.2	6,264	18.7	6,323	18.9	6,382	19.1	6,441	19.3
	17	Thanh Tri	260.4	7,918	30.4	8,064	31.0	8,209	31.5	8,355	32.1
	18	Thinh Liet	301.8	9,047	30.0	10,035	33.3	11,024	36.5	12,012	39.8
	19	Trap Phu	357.9	4,764	13.3	4,604	12.9	4,443	12.4	4,283	12.0
	20	Tu Hiep	467.2	8,203	17.6	8,277	17.7	8,352	17.9	8,426	18.0
	21	Van Dien T	68.6	9,851	143.7	10,146	147.9	10,431	152.0	10,715	156.2
	22	Van Phuc	570.0	8,516	14.9	8,637	15.2	8,758	15.4	8,879	15.6
	23	Vinh Quynh	520.0	14,650	28.2	14,738	28.3	14,825	28.5	14,913	28.7
	24	Vinh Tuy (I)	180.6	20,317	112.5	20,488	113.4	20,659	114.4	20,829	115.3
	25	Yen My	498.4	3,948	7.9	4,086	8.2	4,224	8.5	4,362	8.8
	26	Yen So	710.7	8,039	11.3	8,154	11.5	8,270	11.6	8,385	11.8
Total of Rural Area			5,603.7	85,452	15.2	84,371	15.1	83,289	14.9	82,206	14.7
Total of DID			4,302.0	128,203	29.8	143,376	33.3	158,551	36.9	173,720	40.4
			(67.88%)								
Total			9,905.7	213,655	21.6	227,747	23.0	241,840	24.4	255,926	25.8

Total of Rural Area in Suburban	48,936.4	460,861	9.4	480,400	9.8	499,936	10.2	519,460	10.6		
Total of DID in Suburban	34,231.4	729,623	21.3	981,701	28.7	1,233,781	36.0	1,485,833	43.4		
			(74.10%)								
Total of Whole Suburban	83,227.8	1,190,484	14.3	1,462,101	17.6	1,733,717	20.8	2,005,293	24.1		

Total of Rural Area in Hanoi City	48,936.4	460,861	9.4	480,400	9.8	499,936	10.2	519,460	10.6		
Total of DID in Hanoi City	40,064.8	1,934,026	48.3	2,203,451	55.0	2,472,879	61.7	2,742,250	68.4		
			(84.07%)								
Total of Whole Hanoi City	89,061.2	2,394,887	26.9	2,683,851	30.1	2,972,815	33.4	3,261,710	36.6		

APPENDIX B-3 Survey on Water Usage

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Appendix

1 INTRODUCTION

1.1 GENERAL

The survey's objectives have been set forth as follows :

- A. to examine unit water consumption for domestic use as well as non-domestic use
- B. to research on the actual conditions of water use in Hanoi city
- C. to research on affordability as to piped water supplied households and on willingness as to no piped water supplied households
- D. to research on water leakage inside household

1.2 SURVEY METHOD

1.2.1 SURVEY OBJECT

The Survey is targeted to all the water users in Hanoi city which are divided into the following to classifications :

- a. Domestic user ;
It is defined as water user who uses water for domestic life such as drinking, cooking, washing, bathing and so on. Therefore, one domestic user can be regarded as one household.
- b. Non-domestic user ;
It is defined as water user except domestic user, such as, office, hospital, school, shop, hotel, etc..

The survey population are established from the existing four urban districts except Tay Ho district and the five suburban districts such as Ba Dinh, Dong Da, Hai Ba Trung, Hoan Kiem, Dong Anh, Gia Lam, Soc Son, Thanh Tri and Tu Liem. Only Tay Ho of urban district was excluded form the population since the newly established district is considered to be different from the other four urban districts in the view point of piped water supply.

1.2.2 SAMPLING

The random sampling method was applied so as to sample uniformly from the populations. The sampling procedures are described below :

a. Urban districts

Prior to the interview, 100 samples for each district were selected at random from the water customers of HWBC. Four hundreds of customers are selected in total.

b. Suburban districts

Every Interviewee was selected by the interviewer at site in conformity to the instruction that 50 samples for each district should be selected at random.

1.2.3 INTERVIEW PROCEDURE

(1) Personnel

The survey has been designed and implemented by the JICA Study Team and the interview itself was carried out by the four teams of three Vietnamese engineers.

(2) Survey Period

The interview has been carried out from 1 to 30 of April 1996.

1.2.4 QUESTIONNAIRE

The survey sheets were prepared in Vietnamese based on the questionnaire in English. The questionnaire are attached in Appendix WU-01. The questionnaire consists from the following items :

(1) General Conditions

District
Type of building
Whole area
Main fuel
Electric power supply
City water supply

(2) Questions for residents

Family size
Income per year per household
Occupation of the main earning person
House ownership
Utilization of consumer durables
Taking bath frequency
Type of toilet

(3) Questions only for city water supplied household

Service level
Water leakage inside house
Water tariff system
Satisfaction for city water service
Affordability to pay the water charge

(4) Questions only for no city water supplied household

Water source
Water quality
Water consumption
Duty for taking water
Willingness for city water supply
Acceptable water charge per month

1.2.5 TOTALIZING

(1) Area Division

In accordance with the degree of urbanization, the following three areas are defined :

- a. Urban area ;
is defined as an urbanized area which includes existing four urban districts such as Ba Dinh, Dong Da, Hoan Kiem and Hai Ba Trung.
- b. DID (Densely Inhabited District) area ;
has a definition of densely inhabited zones in every suburban district.
- c. Rural area ;
is defined as the rest of suburban districts except DID area.

(2) Count of the answers

The answer for the questions have been counted by dividing into above three areas in order to examine the features of the defined areas.

1.2.6 RESPONDENTS

(1) Interviewee

The lists of Interviewee are attached in Appendix WU-02 as to domestic users and as to non-domestic users.

(2) Survey Area

The interviewed area and the number of respondents for every district are illustrated in Figure 03-1 of Appendix WU-03.

2 UNIT WATER CONSUMPTION

2.1 DOMESTIC USE

2.1.1 DAILY WATER CONSUMPTION

Daily water consumption per capita has been calculated based on the water consumption data and the family size data of the household. In calculation, the water customers' data of HWBC has been applied to the household's water consumption data as for the piped water supplied households and the interviewed data has been applied as for the no piped water supplied households.

The daily water consumption per capita is tabulated in the attached frequency distribution table of Table 04-14. Based on it, the rate of households among each area are shown in Figure 2-1. The average daily water consumption per capita is concluded as follows :

- a. Urban area ; 93 liters/cap/day
- b. DID area ; 70 liters/cap/day
- c. Rural area ; 60 liters/cap/day

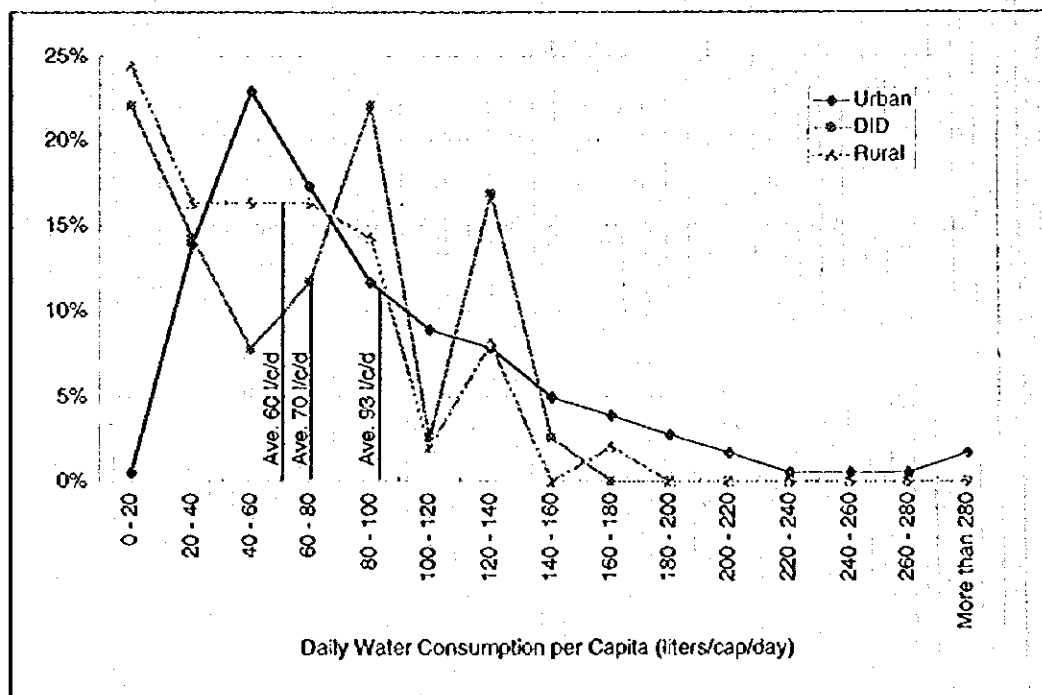


Figure 2-1 The rate of households among area and its daily water consumption per capita.

2.1.2 CONSUMER DURABLES

(1) Possession Rate

Figure 2-2 shows the possession rate of flush toilet and consumer durables such as washing machine, shower, bathtub, etc.. A tendency can be identified that the possession rate increase at the every item in accordance with the urbanization.

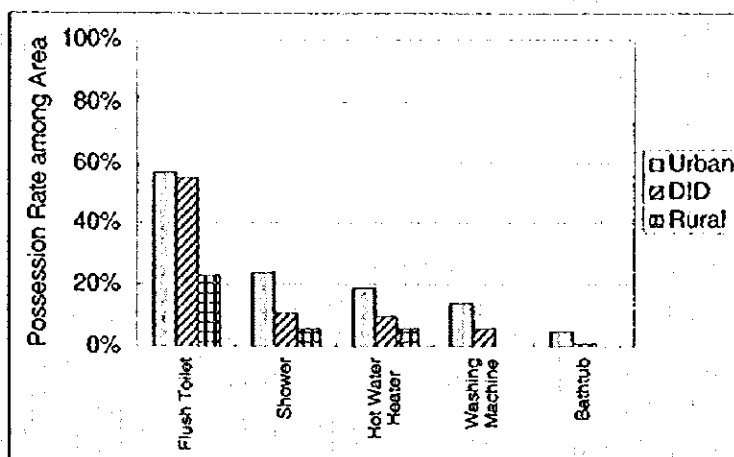


Figure 2-2 Possession Rate of Consumer Durables and Flush Toilet

(2) Consumer Durables and Water Consumption

The possession rate as for Urban area is shown in Figure 2-3 that stands out the difference between possession and no possession in respect to its water consumption. But the difference is not necessarily equal to the water consumption due to the equipment.

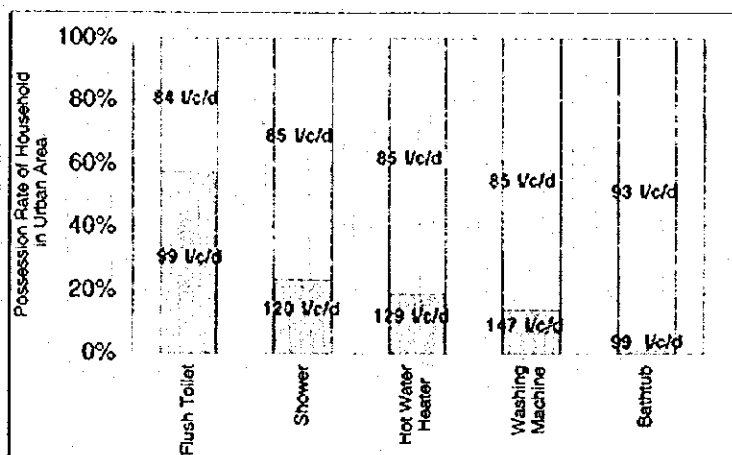


Figure 2-3 Consumer Durables and Water Consumption

2.2 NON-DOMESTIC USE

Among the several unit consumption that is commonly referred, this report takes into account of daily water consumption per area and per person. As for the hospitals and the hotels, the unit of water consumption per bed has been examined as well.

No-piped water supplied water users' data has been excluded for the calculation because of an assumption that the interview data about water consumption might be inexact data. Accordingly, the HWBC customers' data of Urban area and its interview data have been applied. Table 04-23a - g present the daily water consumption. Figure 2-4a and b shows the daily water consumption per area and per capita for every category.

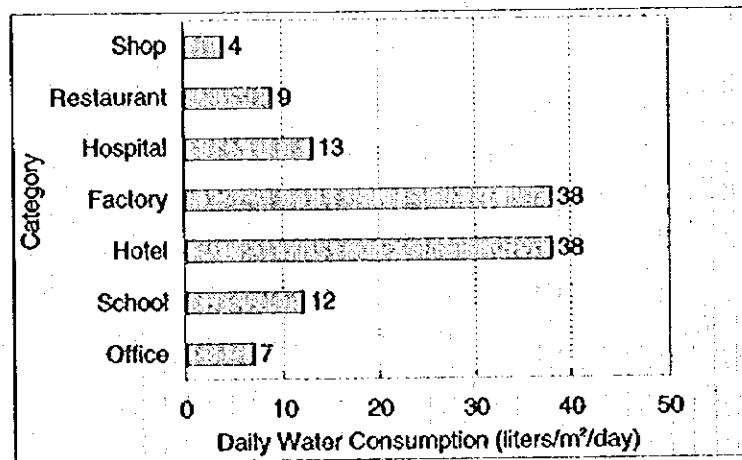


Figure 2-4a Daily Water Consumption per Area for Non-domestic Use

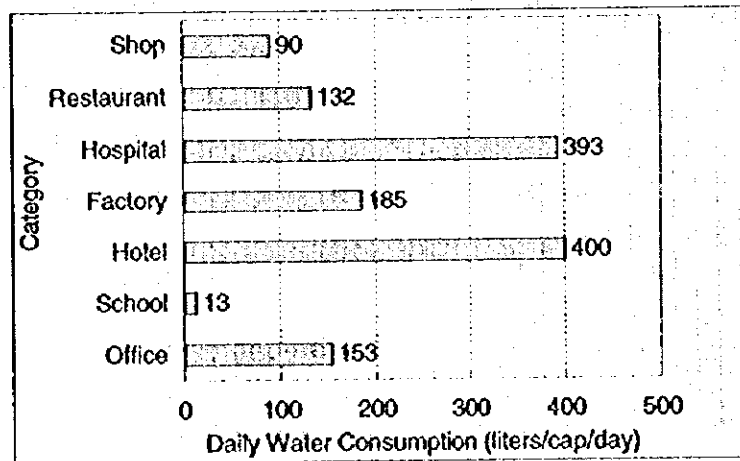


Figure 2-4b Daily Water Consumption per Capita for Non-domestic Use

3 WATER USE CONDITION

3.1 CLASSIFICATION BY EQUIPMENT

3.1.1 CLASS DEFINITION

Based on an assumption that the type of possession of consumer durables represents their living standard to some extent, the domestic water users have been classified according to their type of possession of consumer durables which data has been obtained in the interview. The following three classes have been defined :

Class A ; shower and other consumer durables

Class B ; shower only

Class C ; no shower

3.1.2 WATER CONSUMPTION BY CLASS

Figure 3-1 shows the class ratio among each area that have been classified in conformity with the above definition. It is apparent that the rate of Class A or B increases in accordance with urbanization and that the households in Class A and B consume more water in amount than the Class C households.

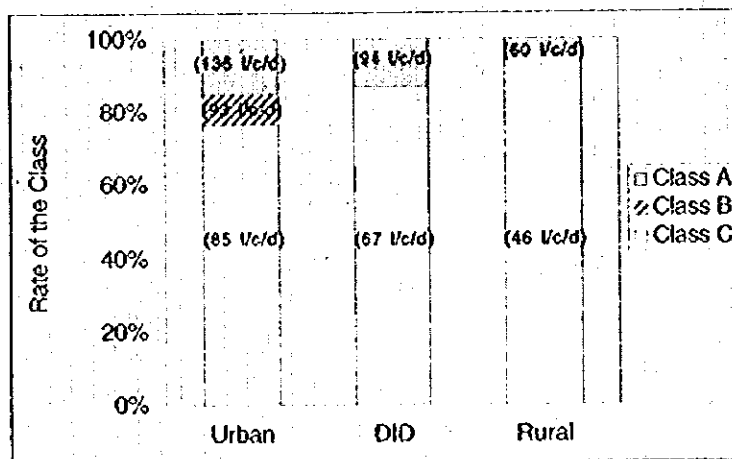


Figure 3-1 Class Ratio among each Area

3.2 SANITATION

3.2.1 TYPE OF TOILET

Figure 3-2 illustrates the ratio of toilet type among each area. It might be said that the individual toilet is more popular in Rural area than in Urban and DID. However, seeing the flush toilet, the rate of it is 58% in Urban, 55% in DID and 23% in Rural, in short, it spreads more according to the urbanization.

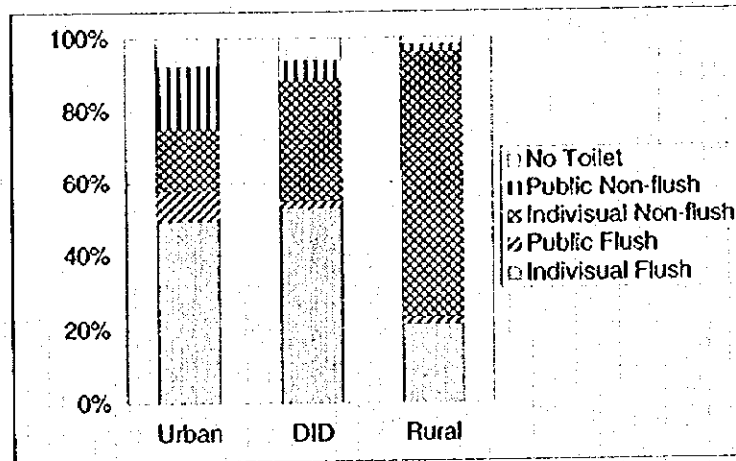


Figure 3-2 Ratio of toilet type by areas

3.2.2 BATHING

(1) Equipment

Seeing Table 04-5 which is tabulated in respect to the consumer durables, it can be said that the bath equipment such as shower, bathtub and hot water heater is not so popular. However, taking into consideration that the rate of possession increases according to the urbanization, such equipments can become popular in the future.

(2) Frequency

From the interview result which is shown in Table 04-7, it is understood that bath taking frequency differs by season, that is, almost all respondents take bath everyday in summer and about every three days in winter. Clear difference by areas can not be identified from the result.

4 AFFORDABILITY AND WILLINGNESS

4.1 INCOME LEVEL AND PUBLIC SERVICE CHARGE

4.1.1 INCOME LEVEL

(1) Income per Household

Based on the income data obtained from the interview, annual income per household is tabulated in the frequency distribution table of Table 04-2 of which class-interval is VND 2 million.

Both of the value of VND 8.9 million in average and VND 8.0 million in mean are situated in the range from VND 7 to 9 million.

(2) Classification

Taking into consideration of the distribution, the income level is classified at the following condition :

- Low income ; VND 5,000,000.- or less
- Middle income ; VND 5,000,001.- to 13,000,000.-
- High income ; VND13,000,001 or more

Figure 4-1 illustrates the income level ratio of all respondents.

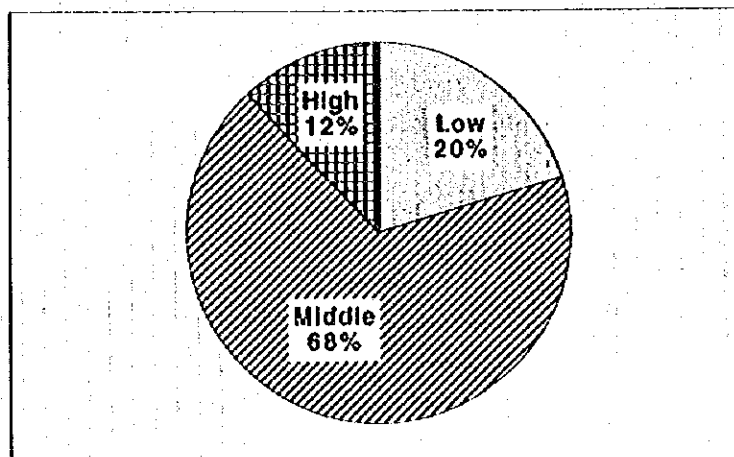


FIGURE 4-1 INCOME LEVEL

4.1.2 PUBLIC SERVICE CHARGE

(1) Water Charge and Electric Power Charge

Figure 4-2 shows comparison between average water charge and average electric power charge per month by the income level. It is identified that the water charge is much lower in amount than the electric power charge.

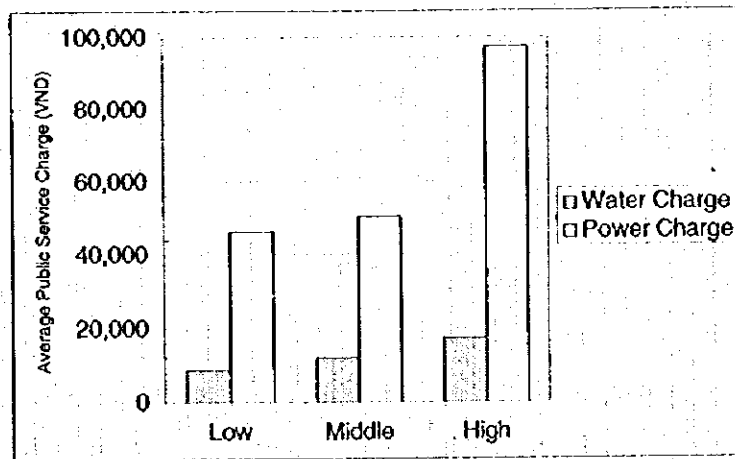


FIGURE 4-2 Public Service Charge

(2) Public Service Charge to Income

Figure 4-3 shows the average ratio of the public service charge to income per month by income level. Compared to Figure 4-2, it can be understood that the public charge is smaller in amount at Low income level but the ratio to income becomes high in its ratio.

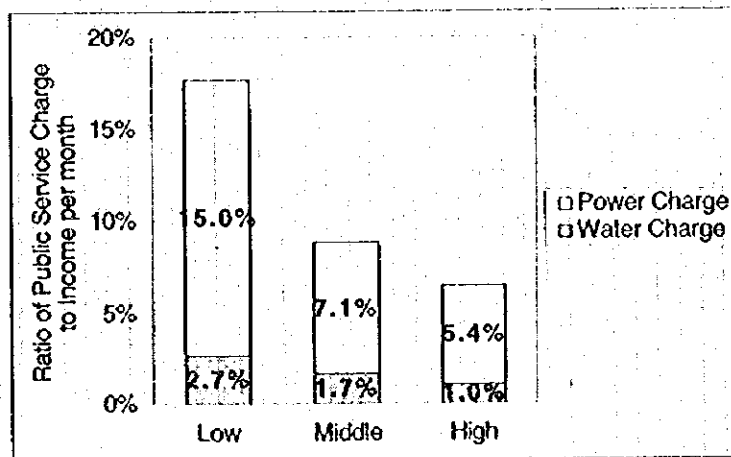


FIGURE 4-3 Public Service Charge to Income

4.2 AFFORDABILITY AND WILLINGNESS

4.2.1 AFFORDABILITY IN PIPED WATER SUPPLIED AREA

(1) Service Level

Seeing the service level whether house connection or public tap in Table 04-11, the rate of house connection is 97% or amounting 250 out of 257 respondents. The six households of the rest seven are in Tu Liem district where the ratio between house connection and public tap is one to six.

It must be noticed that the rate of house connection be higher than actual since the sample households for Urban area have been selected from the customers list of HWBC.

(2) Satisfaction

Satisfaction with the city water service have been took census in respect to water quantity, pressure and quality. Table 04-15 shows the result obtained from the 256 piped water supplied households.

Figure 4-4 presents the satisfaction rate of urban and suburban districts. As for urban district, its rate of pressure is 59 percent that seems to be low among the items. The satisfaction rate of suburban is proved to be much lower at every item in comparison with the result of urban districts.

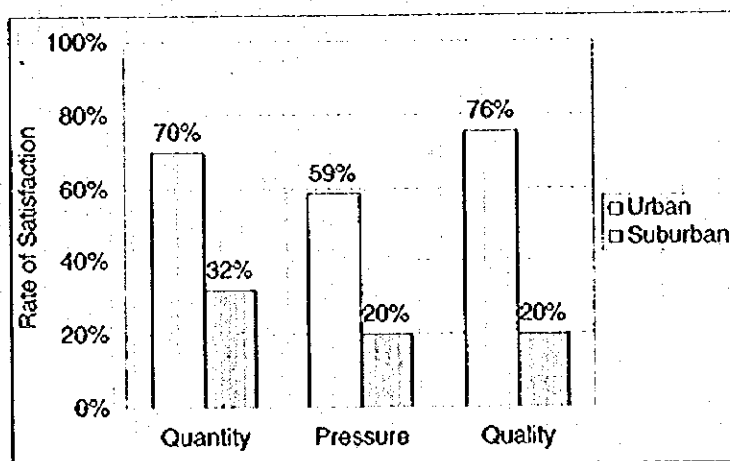


Figure 4-4 Satisfaction with the City Water Service

4.2.2 WILLINGNESS IN NO PIPED WATER SUPPLIED AREA

(1) Water Source

A. Main Water Source

The water source as for no piped water supplied households are shown in Figure 4-6 based on Table 04-16a. 50 percent of 131 respondents in total take water from deep wells and 39 percent from shallow wells. There are some households that purchase water in Thanh Tri and Tu Liem district. As for the other water source, it is identified that rain water or pond water be in use.

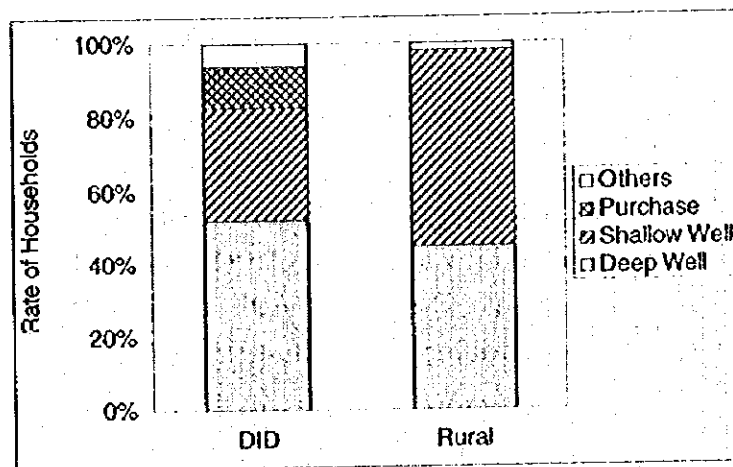


Figure 4-5 Water Source

B. Alternative Water Source

Table 04-16b is tabulated from 17 respondents in respect to the alternative water source in dry season. It is shown that rain water and pond water are used for it and that some households in Rural area get water from their neighborhoods.

C. Water Quality

Figure 4-6 shows water quality for each water source based on Table 04-18. The majority for every water source answered that the water is drinkable after boiled. Some households answered that they apply the other method such as their own filter equipment.

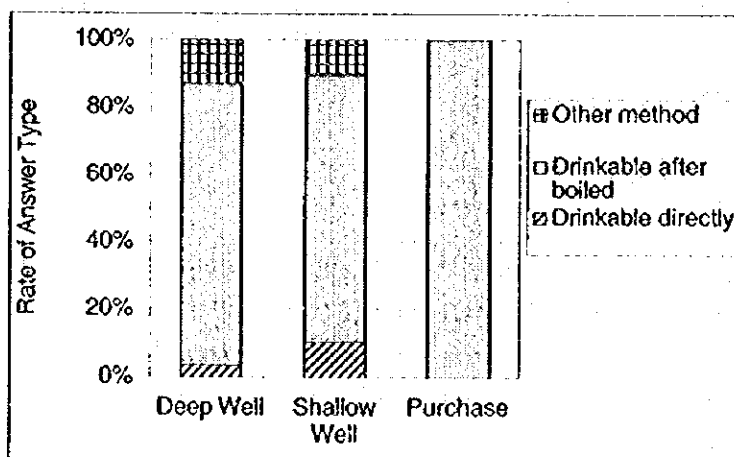


Figure 4-6 Water Source and its Water Quality

(2) Willingness

From the result of Table 04-20a which is tabulated about the willingness for city water supply, it is proved that as many as 115 out of 124 households have willingness for piped water. The average water charge per month comes to VND 17,575.-. The ratio between willingness and no willingness are illustrated in Figure 4-7.

Main reasons for above answer have been tabulated in Table 04-20b. The households of willingness have desire for safe water and convenience. Two kinds of reasons for no willingness are identified. One is that adequate water is available from their own wells, another is that they can not afford to pay the water charge.

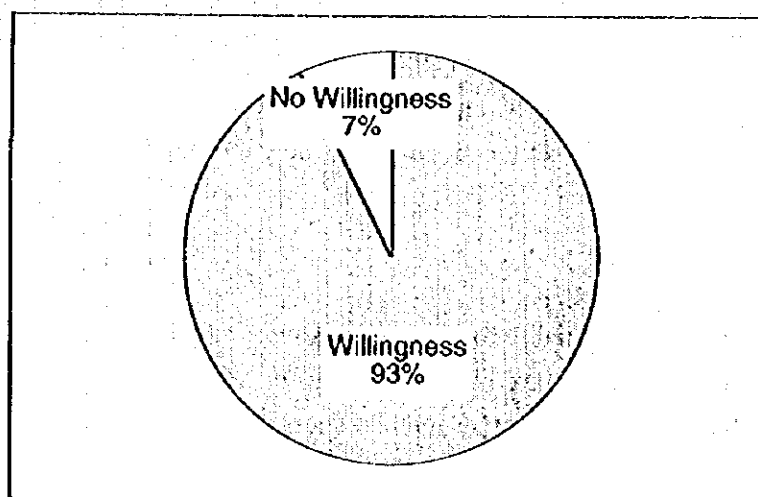


Figure 4-7 Willingness

4.3 WATER CHARGE

4.3.1 CURRENT WATER CHARGE AND AFFORDABLE CHARGE

Figure 4-8 compares the current water charge per month with affordable water charge as to the piped water supplied households and with acceptable water charge as to the no piped water supplied households which have willingness for city water supply.

It is proved that the affordable price in average slightly surpass the current water charge at every income level. It means that the higher water charge than current charge can be accepted by the water users. It is remarkable that the acceptable water charge as to no-piped water supplied household are high compared to the piped water supplied households even of Low income.

4.3.2 ACCEPTABLE WATER CHARGE

In order to examine the acceptable water charge, it is necessary to take into consideration of the affordable charge of the Low income level which might be about VND 10,000.-. However, seeing that the no-piped water supplied households have much willingness to piped water supply and affordability to pay the water charge at least VND 16,000.-, it is expected that the affordable water charge of no-piped water supplied households can be accepted by the piped-water supplied households as well.

The acceptable monthly water charge per household is concluded to be VND 16,000.-.

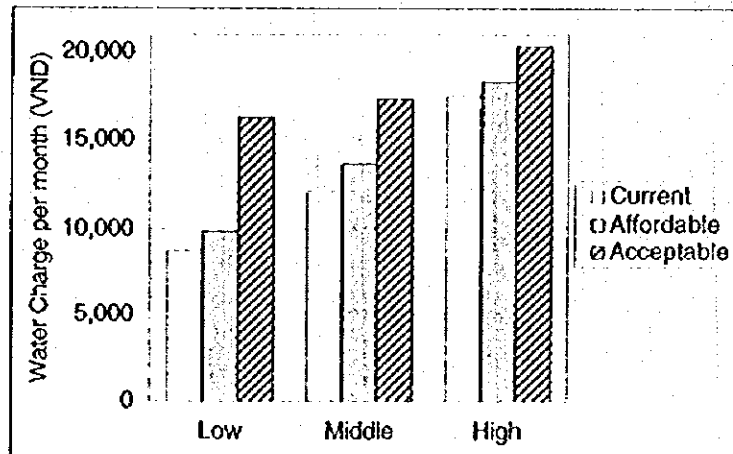


Figure 4-8 Water Charge

5 WATER LEAKAGE

Table 04-12 is tabulated in respect to the water leakage inside house which are supplied piped water. The result have been obtained by the question of leakage degree which is divided into the following four degree :

- a. Much
- b. Considerable
- c. Little
- d. No

Figure 5-1 shows the rate of the four degrees. According to it, as much as 94.7 percent of households answered that there is no leakage. As a conclusion, it can be said that there is little leakage inside house.

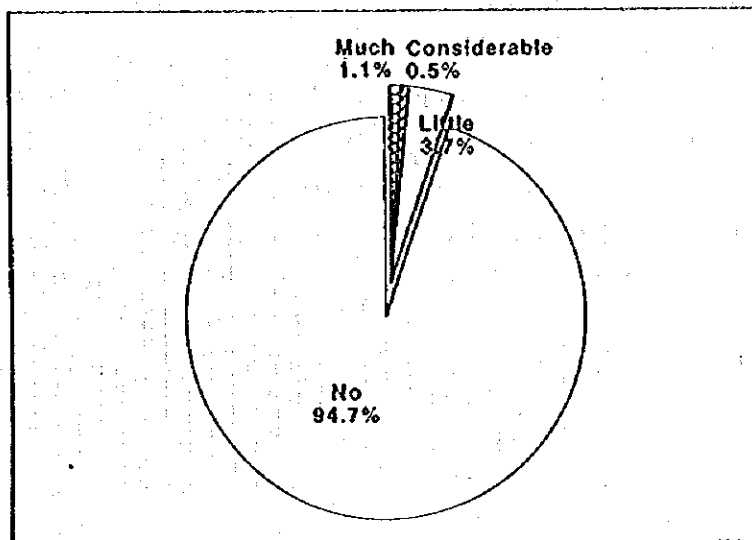


Figure 5-1 Water Leakage Inside House