APPENDIX K : TABLES

Table K.1.1 Existing Water Supply Systems in Nam Dan District

Name of the Commune	Area (km2)	Population in 1996 (no. of persons)	Density (p/km2)	Tubewell			Dugwell			Gravity Flow System (number)	Filtration Tank (number)
				Number	Average Depth	Covered Population	Number	Average Depth	Covered Population		
Semi-Montainous Area											
1. Nam Hung	31.6	3,757	118.9	0	-	0	701	6.5	3,556	0	0
2. Nam Nghia	12.2	4,086	334.9	0	-	0	911	7.2	4,086	0	0
3. Nam Thai	11.7	2,797	239.1	0	-	0	607	9.0	2,976	0	0
4. Nam Thanh	25.9	7,560	291.9	0	-	0	1,506	7.2	8,639	2	1,322
5. Nam Anh	12.6	2,651	210.4	0	-	0	1,426	5.7	6,807	0	0
6. Van Dien	12.8	10,990	858.6	0	-	0	2,082	9.8	11,432	0	0
7. Xuan Hoa	6.5	5,831	897.1	5	14.0	24	1,227	4.7	5,889	0	1,001
8. Nam Xuan	11.7	5,968	510.1	0	-	0	1,109	4.8	5,759	0	0
Sub-total	125	43,640	349.1	5	14.0	24	9,569	6.9	49,144	2	2,323
Plain Area											
9. Nam Dan Town	16.6	5,910	356.0	11	25.5	52	936	5.3	3,663	0	928
10. Nam Linh	8.9	5,964	670.1	4	9.0	19	1,232	7.0	5,991	0	2
11. Hung Tien	8.8	8,360	950.0	51	13.0	249	1,284	4.7	8,924	0	351
12. Kim Lien	13.5	11,056	819.0	154	15.2	722	1,926	5.2	5,664	0	2,071
13. Nam Giang	12.7	5,108	402.2	49	14.0	175	959	4.8	5,683	0	362
14. Nam Cat	6.5	5,818	895.1	75	17.5	361	766	5.1	3,910	0	412
15. Hong Long	7.0	5,116	730.9	771	5.9	5,116	785	6.0	5,116	0	357
16. Xuan Lam	9.1	9,035	992.9	10	12.8	55	1,210	5.1	8,963	0	190
Sub-total	83.1	56,367	678.3	1,125	14.1	6,749	9,098	5.4	47,914	0	4,673
Right side of Lam river Area											
17. Nam Thuong	7.3	2,320	317.8	0	-	0	91	8.0	1,561	0	65
18. Nam Tan	11.9	4,313	362.4	0	-	0	826	7.4	4,140	0	0
19. Nam Loc	11.0	5,505	500.5	0	-	0	589	8.1	5,505	0	0
20. Khanh Son	37.7	12,051	319.7	19	11.6	74	1,926	6.8	12,826	0	375
21. Nam Trung	6.5	7,295	1122.3	147	14.8	691	1,218	4.9	5,766	0	382
22. Nam Cuong	5.8	5,705	983.6	31	9.0	155	790	6.6	5,705	0	131
23. Nam Kim	17.3	9,471	547.5	22	30.1	97	1,788	7.1	9,476	0	309
24. Nam Phuc	5.4	3,248	601.5	55	13.9	499	519	6.9	3,978	0	18
Sub-total	102.9	49,908	485.0	274	15.9	1,516	7,747	7.0	48,957	0	1,280
TOTAL	311.0	149,915	482.0	1,404	14.7	8,289	26,414	6.4	146,015	2	8,276

Note: The source for the population data is the Statistical Data of Nghe An Province
The source for the number of wells and population served by them is the Field Survey

Table K.1.2 Outline of Existing Water Supply System in Nam Dan District

Area	Name of commune	Tube Wells					Dug Wells					Number of tanks	
		No. of wells	No. of Household	Well depth			No. of wells	No. of Household	Well depth			Filter tank	Rain water tank
				Average	Minimum	Maximum			Average	Minimum	Maximum		
Semi-Mount. Area	Nam Hung	701	756	7	4	11							
	Nam Nghia	911	921	7	5	10							
	Nam Thai	607	605	9	7	12							
	Nam Thanh	1,506	1,652	7	7	8						1,322	
	Nam Anh	1,426	1,498	6	5	7							
	Van Dien	2,082	2,456	10	8	12							
	Xuan Hoa	1,227	1,293	5	4	6	5	5				1,001	187
	Nam Xuan	1,109	1,390	5	4	6							11
	Subtotal	9,569	10,571				5	5				2,323	198
Plain Area	Nam Dan Town	936		5	4	7	11	11	26	24	29	928	
	Nam Linh	1,232	1,296	7	6	8	4	14	9	8	11	2	100
	Hung Tien	1,284	1,870	5	4	6	51	53	13	9	17	351	14
	Kim Lien	1,926	5,958	5	4	8	154	146	15	10	23	2,071	13
	Nam Giang	959	1,239	5	5	6	49	41	14	13	17	362	13
	Nam Cat	766	1,960	5	5	5	75	75	18	17	19	412	16
	Hong Long	785	1,738	6	5	8	771	974	6	5	9	357	
	Xuan Lam	1,210	1,872	5	4	9	10	10			13	190	10
	Subtotal	9,098	15,933				1,125	1,324				4,673	166
Right bank of Lam river Area	Nam Thuong	91	257	8	7	9						65	
	Nam Tan	826	818	7	5	11							
	Nam Loc	589	1,059	8	7	10							1
	Khanh Son	1,926	1,007	7	6	8	19	15	12	11	13	375	
	Nam Trung	1,218	1,560	5	5	6	147	144	15	17	19	382	
	Nam Cuong	790	1,237	7	6	8	31	29	9	9	10	131	
	Nam Kim	1,788		7	6	9	22	22	30	24	36	309	
	Nam Phuc	519	872	7	6	8	55	109	14	17	22	18	
	Subtotal	7,747	6,810				274	319				1,280	1
	Total	26,414	33,314				1,404	1,648				8,276	365

Table K.1.3 Communes Assisted by UNICEF's Program in Nam Dan District

Region	Name of commune	Total installation in Namdan						
		Tubewell		Improved dugwells	Dugwells	Iron Fillter tank	Raining water tank	Water gravity system
		Slug	Machine					
Semi-Mount. Area	Nam Hung							
	Nam Nghia							
	Nam Thai							
	Nam Thanh			7				
	Nam Anh			12				1
	Van Dien			2				
	Xuan Hoa	15		2				
	Nam Xuan			1				
	Sub total	15		24				1
Plain Area	Nam Dan			2	1		1	
	Nam Linh	3	8	3		3		
	Hung Tien	96	45	1		76		
	Kim Lien	88	70			95		
	Nam Giang	18	21	2		3		
	Nam Cat	14	49		1	30		
	Hong Long		1	2				
	Xuan Lam							
	Sub total	219	194	10	2	207	1	
Right bank of Lam river Area	Nam Thuong							
	Nam Tan			4				
	Nam Loc		1		1			
	Khanh Son		6	1				
	Nam Trung	33	18					
	Nam Cuong	2	3					
	Nam Kim		50			50		
	Nam Phuc	8	43	1		20		
	Sub total	43	121	6	1	70		
	Total	277	315	40	3	277	1	1

Table K.2.1 Groundwater Quality of Test Boreholes

Analyzed by Hydrogeological Team No.2F ,Hanoi

Boreholes / Parameter	Unit	JICA1 Nam Kim	JICA2 Nam Trung	JICA3 Khanh Son	JICA4 Nam Nghia	JICA5 Kim Lien	JICA6 Nam Xuan	Criteria for Drinking Water(Rural)	WHO's Guideline
pH	-	5.5	6.3	6.0	8.5	6.02	6.7	6.5 - 8.5	(6.5 - 9.2)
NH_4^+	mg/l	1.05	4.66	1.46	-	1.37	4.35	3.0	1.5
NO_3^-	mg/l	2.16	3.10	2.43	-	4.13	2.66	10	50
Fe^{++}	mg/l	2.10	3.83	53.68	0.12	62.3	0.69	0.5	0.3
Hardness		0.24	2.39	2.16	-	0.95	1.10	500	-
Mn^{++}	mg/l	0.05	0.54	1.84	-	1.08	0.22	0.1	0.5
SO_4^{-2}	mg/l	27.98	10.29	32.71	73.87	22.63	16.50	400	250
AS	mg/l	0.003	0.004	0.003	-	0.009	0.005	0.05	0.01
Zn	mg/l	0.031	0.032	0.024	-	0.024	0.033	5	3
Cd	mg/l	0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	0.005	0.003
Pb	mg/l	0.006	< 0.01	0.003	-	< 0.01	0.002	0.05	0.01
CN	mg/l	0.006	0.007	0.004	-	0.005	0.002	0.1	0.07
Hg	mg/l	0.001	< 0.001	0.001	-	< 0.001	0.001	0.001	0.001
Cu	mg/l	0.01	< 0.008	0.006	-	0.009	0.008	1	2
Total coliforms	ml		0/100	0/100		0/100	200/100	0.05	0.05
Total faecal coiforms	ml		0/100	0/100		0/100	0/100	-	-
HCO_3^- mg/l		24.4	69.3	24.4	280.69	63.7	87.6		
CO_3^{--} mg/l		12.05	7.52	10.21	24.0	5.26	0.13		
Cl^- mg/l		12.39	16.28	153.99	18.36	57.35	40.71		(600)
Na^+ mg/l		3.01	23.55	45.34	147.08	8.05	26.42		(200)
K^+ mg/l		1.16	1.97	4.23		4.08	4.15		
Ca^{++} mg/l		1.60	43.2	32.00	12.52	12.8	12.80		(200)
Mg^{++}		1.92	2.88	6.72	5.25	3.84	5.64		(150)
SiO_2		10.78	31.3	9.18	12.5	17.61	15.92		
Cr		< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	0.05	0.05
F		0.004	0.005	0.006	-	0.019	0.010	0.05	0.05
NO_2^-		Trace	0.03	Trace	0.01	0.017	2.66	0	3
Se		0.021	0.004	0.012		0.006	0.003	0.01	0.01
T.d.s. (g/l)		0.043		0.276	0.421	0.192			

Table K.3.1 Examination of Water Supply System Options

Option		Evaluation	Water Source and Topography	Water Use, Operation and Maintenance	Economic Aspects
A	Dugwell with filter tank using shallow groundwater	Suitable as a temporary system until a new water supply facility is provided.	Difficult to secure sufficient amount of water throughout the year. Difficult to avoid contamination by human and animal wastes	Energy is not needed to operate. People can operate and maintaince the system.	Capital and O&M costs are very low.
B	Tubewell with hand pump and filter tank using shallow groundwater	Suitable in areas where it is possible to get sufficient and safe water from shallow groundwater.	In higher elevation areas, it is difficult to drill the wells and to secure sufficient amount of water throughout the year.	Energy is not needed to operate. People can operate and maintenance the system.	Capital and O&M costs are moderately low.
C	House connections system supplied by distribution pipelines with submersible pump and treatment plant using deep groundwater	Suitable in high population density and high residents income area, such as Nam Dan Town area.	Detailed groundwater survey is required to select well sites with high water potentiality	Electricity is needed to operate. High levels of operation and maintenance skills are required. Most desirable service level for water supply.	Capital and O&M costs become very high if the area has less than a certain number of population.
D	Public hydrants system supplied by distribution pipelines with submersible pump and treatment plant using deep groundwater	Suitable in areas other than those in where it is possible to get sufficient and safe water from shallow groundwater.	Detailed groundwater survey is required to select well sites with high water potentiality	Electricity is needed to operate. High levels of operation and maintenance skills are required. Desirable service level for water supply.	Capital and O&M costs become high if the area has less than a certain number of population.
E	Public hydrants system supplied by distribution pipelines with power pump and treatment plant using stream water	Unsuitable because of difficulty to secure sufficient amount of water.	Difficult to secure sufficient amount of water throughout the year. Volume of available water is limited.	Electricity is needed to operate. High levels of operation and maintenance skills are required. Good access to safe water.	Capital and O&M costs become high if the area has less than a certain number of population.
F	Public hydrants system supplied by distribution pipelines with power pump and treatment plant using reservoir water	Unsuitable because of difficulty to secure sufficient amount of water.	Difficult to secure sufficient amount of water throughout the year. Volume of available water is limited.	Electricity is needed to operate. High levels of operation and maintenance skills are required. Good access to safe water.	Capital and O&M costs become high if the area has less than a certain number of population.
G	Public hydrants system supplied by distribution pipelines with power pump and treatment plant using river water	Unsuitable because Capital and O&M costs are very high for scarce population.	No problem exists for securing a domestic water. Special attention is needed to install intake and treatment facilities.	Electricity is needed to operate. High levels of operation and maintenance skills are required. Good access to safe water.	Capital and O&M costs become very high if the area has less than a certain number of population.
H	Tanks of rainwater harvested by roof catchment	Unsuitable except as supplementary water source for public facilities.	Difficult to secure sufficient amount of water throughout the year. Volume of available water is very limited.	Energy is not needed to operate. Local people can operate and manage the system.	Capital and O&M costs are very low.

Table K.3.2 Summary of Proposed Water Supply Plan

Scheme	New Scheme				Improvement Scheme	
System No.	System N-1	System N-2			Improve I-1	Improve I-2
Service Area	Nam Dan Town	Dried-up Area	Inundation Area	Plain Area	Nam Anh Comm.	Out of New Scheme
Number of Communes	1	17		5	1	6
Average Number of Households per Commune	1,328	1,318	1,452	1,722	1,527	1,406
Average of Population per Commune in 2,010	7,092	6,708	7,952	9,456	3,181	7,496
Planning Criteria						
(a) Water source	Deep well	Deep well	Deep well	Deep well	Stream	Shallow well
(b) Type of system	House connection	Public hydrants	Public hydrants	Public hydrants	Public hydrants	Hand pump
(c) Unit water demand (l/capita/day)	60	30	30	30	30	30
(d) Average daily demand (m3/day)	426	201	239	284	95	-
(e) Average daily distribution (m3/day)	501	237	281	334	112	-
(f) Maximum daily distribution (m3/day)	680	320	380	450	-	-
(g) Maximum daily intake (m3/day)	800	350	400	500	-	-
Major Facilities						
1) Water Source Facility						
Deep well	120m depth x 6Nos	120m depth x 4No	100m depth x 1No	80m depth x 1No	-	-
Submersible intake pump	0.2 m3/min x 6 No	0.2 m3/min x 4No	0.2 m3/min x 1 No	0.2 m3/min l/s x 1 No	-	-
2) Treatment Facility						
Treatment equipment	6 m2 x 2 beds	3 m2 x 2 beds	4 m2 x 2 beds	5 m2 x 2 beds	-	-
Distribution reservoir	70 m3	30 m3	35 m3	35 m3	-	-
Distribution pump	0.4 m3/min x 3 units	0.3 m3 x 1 unit	0.4 m3 x 1 unit	0.4 m3 x 1 unit	-	-
3) Distribution Facility						
Distribution pipeline	10,000 m	10,000 m	10,000 m	10,000 m	400 m	-
Number of public taps	5 Nos	30 Nos	30 Nos	30 Nos	3 Nos	-
4) Filter tank	-	-	-	-	2 m3 x 2 Nos	2 m3

Table K.4.1 Water Demand of Service Blocks

No.	Service Block	No. of village	Served Population in 2010	Unit water demand (l/cap/day)	Average daily demand (m^3/day)	Average daily distribution (m^3/day)	Average daily intake (m^3/day)	Maxmum daily intake (m^3/day)	Maxmum daily distribution (m^3/day)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Nam Hung	10	4,508	30	135	159	172	232	215
2	Nam Nghia	11	4,903	30	147	173	187	252	234
3	Nam Thai	7	3,356	30	101	118	128	173	160
4	Nam Thanh	14	9,072	30	272	320	346	467	432
5	Nam Anh - South Nam Xuan - South	4 3 > 7	5,303	30	159	187	202	273	253
6	Nam Xuan - North	9	5,040	30	151	178	192	259	240
7	Van Dien - West	5	3,181	30	95	112	121	164	152
8	Van Dien - East	13	10,007	30	300	353	381	515	477
9	Nam Linh	13	7,157	30	215	253	273	368	341
10	Nam Giang	12	6,130	30	184	216	234	315	292
11	Nam Cat	12	6,982	30	209	246	266	359	333
12	Nam Tan	7	5,176	30	155	183	197	266	247
13	Nam Loc	11	6,606	30	198	233	252	340	315
14	Khanh Son - West	7	3,302	30	99	117	126	170	157
15	Khanh Son - South	7	4,058	30	122	143	155	209	193
16	Khanh Son-East Nam Trung	14 14 > 28	15,854	30	476	560	604	816	755
17	Nam Kim - West	15	9,018	30	271	318	344	464	430
18	Nam Kim - East Nam Phuc	5 8 > 13	6,245	30	187	220	238	321	298
19	Nam Cuong	10	6,846	30	205	242	261	352	326
	Total	**211**	**122,744**		**3,682**	**4,332**	**4,679**	**6,316**	**5,848**

Notes:

(5) = (3) x (4)

(6) = (5) /(1-0.15), (Leakage losses = 15%)

(7) = (6) x 1.08, (Treatment losses = 8%)

(8) = (7) x 1.35, (Peak day factor = 1.35)

(9) = (6) x 1.35 (Peak day factor = 1.35)

Table K.4.2 Design Condition of Public Water Supply System

Service Blocks					Water Demand						Distribution Pipelines			Hydrogeological Conditions			
No.	Service Block	Population in 1996 (persons)	Population in 2010 (persons)	Water Supply Condition	Unit Water consuption (l/cap/day)	Average daily demand (m^3/day)	Average daily distribution (m^3/day)	Average daily intake (m^3/day)	Maximum daily intake (m^3/day)	Maximum daily distribution (m^3/day)	Total length of pipelines (m)	Number of public hydrants	Total Head (m)	Geological Type	Well yield (l/sec)	Required number of wells	Design Standard
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(18)
1	Nam Hung	3,757	4,508	Dried-up	30	135	159	172	232	215	14,000	37	32.0	R_B	0.96	3	Class C
2	Nam Nghia	4,086	4,903	Dried-up	30	147	173	187	252	234	10,450	37	30.0	R_B	0.96	3	Class C
3	Nam Thai	2,797	3,356	Inundation	30	101	118	128	173	160	18,440	61	25.0	R_B	0.96	2	Class C
4	Nam Thanh	7,560	9,072	Dried-up	30	272	320	346	467	432	13,900	46	22.7	R_B	0.96	6	Class B
5	Nam Anh - South Nam Xuan - South	4,419	5,303	Dried-up	30	159	187	202	273	253	4,100	16	14.2	R_B	0.96	3	Class C
6	Nam Xuan - North	4,200	5,040	Dried-up	30	151	178	192	259	240	6,980	25	35.0	R_B	0.96	3	Class C
7	Van Dien - West	2,651	3,181	Dried-up	30	95	112	121	164	152	8,610	33	30.0	R_B	0.96	2	Class C
8	Van Dien - East	8,339	10,007	Dried-up	30	300	353	381	515	477	10,350	28	17.5	R_B	0.96	6	Class B
9	Nam Linh	5,964	7,157	Dried-up	30	215	253	273	368	341	12,770	47	20.0	R_B	0.96	4	Class B
10	Nam Giang	5,108	6,130	Dried-up	30	184	216	234	315	292	9,400	24	25.0	R_B	0.96	4	Class B
11	Nam Cat	5,818	6,982	Inundation	30	209	246	266	359	333	7,960	24	13.5	Q_B	0.86	5	Class B
12	Nam Tan	4,313	5,176	Dried-up	30	155	183	197	266	247	7,800	23	27.0	R_B	0.96	3	Class C
13	Nam Loc	5,505	6,606	Dried-up	30	198	233	252	340	315	5,500	19	17.0	R_B	0.96	4	Class B
14	Khanh Son - West	2,752	3,302	Inundation	30	99	117	126	170	157	6,320	22	28.7	RA	3.72	1	Class C
15	Khanh Son - South	3,382	4,058	Dried-up	30	122	143	155	209	193	12,160	40	35.0	RA	3.72	1	Class C
16	Khanh Son - East Nam Trung	13,212	15,854	Inundation	30	476	560	604	816	755	10,480	32	30.5	Q_A	9.98	1	Class A
17	Nam Kim - West	7,515	9,018	Dried-up	30	271	318	344	464	430	14,570	41	29.8	Q_A	9.98	1	Class B
18	Nam Kim - East Nam Phuc	5,204	6,245	Inundation	30	187	220	238	321	298	6,300	17	13.5	Q_A	9.98	1	Class B
19	Nam Cuong	5,705	6,846	Inundation	30	205	242	261	352	326	5,860	14	12.7	Q_A	9.98	1	Class B
	Total	102,287	122,744			3,682	4,332	4,679	6,316	5,848	185,950	586				54	

Note: Q_A - Quaternary-A (Thick aquifer, 9.98 l/s) R_A - Pre-Quaternary-A (O_3-S_1 ld, 3.72 l/s)
Q_B - Quaternary-B (Thin aquifer, 0.86 l/s) R_B -Pre- Quaternary-B (T_2 adt, 0.96 l/s)

Table K.4.3 Treatment Facility by Design Standard

	Class A	Class B	Class C
Aeration			
Structure	Aeration tower, concrete made 4m height with one intermediate floor		
Air-spraying	Perforated spray pipes, Stainless steel		
Aeration area	10 m2	8 m2	4 m2
Contact Basin			
Contact period	30 minutes		
Surface load	55 mm/min		
Structure	Up-flow type concrete basin		
Volume	17 m3	11 m3	7 m3
Sludge removal	Mechanical sludge scraper		
Filtration			
Filtration rate	150 m/d		
Structure	Rapid sand filter, concrete made		
Filtration area	6 m2 x 2 beds	4 m2 x 2 beds	2 m2 x 2 beds
Filter media	0.9 - 1.6 mm grain size sand		
Filter beds	Sand layer : 1.5 m depth Supporting layer : gravel, 150 mm depth		
Water collecting system	Nozzle type Supporting layer : 20 - 30 mm gravel, 150 mm depth		
Backwash system	Surface washing type		
Backwash pump	Single suction centrifugal pump		
	11 kW	7.5 kW	3.7 kW
Distribution Reservoir			
Capacity	Two hours of the treatment capacity		
Structure	Partly underground concrete reservoir		
Volume	70 m3	50 m3	30 m3
Distribution Pumps			
Pump type	Single stage horizontal centrifugal pump		
Total head	30 m		
Discharge capacity	0.8 m3/min	0.5 m3/min	0.3 m3/min
Motor output	5.5 kW	3.7 kW	2.2 kW
Electrical Equipment			
Low-voltage power supply	AC 380 V, 3-phase, 4 wire AC 220 V, single-phase		
Local panel	Backwash pump Filter console		
Administration Building			
Pump room	10 m2		
Control room	6 m2		

Table K.4.4 O/M Cost by Design Standard

Class	(A) Water Distribution	(B) Operation and Maintenance Cost (VND/year) (B1) Staff	(B2) Electricity	(B3) Sand Replacement	(B4) Repair	(B5) Others	(B) Total	(C) O&M Cost per Capacity
Class A 800 m3/d	200,274	32,160,000 27.8%	48,180,000 41.7%	640,000 0.6%	24,040,000 20.8%	10,502,000 9.1%	115,522,000	577
Class B 500 m3/d	125,171	24,120,000 24.3%	32,412,000 32.6%	400,000 0.4%	33,410,000 33.6%	9,034,200 9.1%	99,376,200	794
Class C 300 m3/d	75,103	24,120,000 31.9%	19,272,000 25.5%	240,000 0.3%	25,110,000 33.2%	6,874,200 9.1%	75,616,200	1,007

Calculation Note:

(A) Water Distribution Capacity
[Daily maximum factor : 135%]
[Plant loss : 8%]
Class A = 800 m3/d / 1.08 / 1.35 x 365 days
Class B = 500 m3/d / 1.08 / 1.35 x 365 days
Class C = 300 m3/d / 1.08 / 1.35 x 365 days

(B1) Staff Cost
[Base salary = 670,000 VND/month, 1997 price]
Class A = 4 persons x 670,000 VND/month x 12 months
Class B = 3 persons x 670,000 VND/month x 12 months
Class C = 3 persons x 670,000 VND/month x 12 months

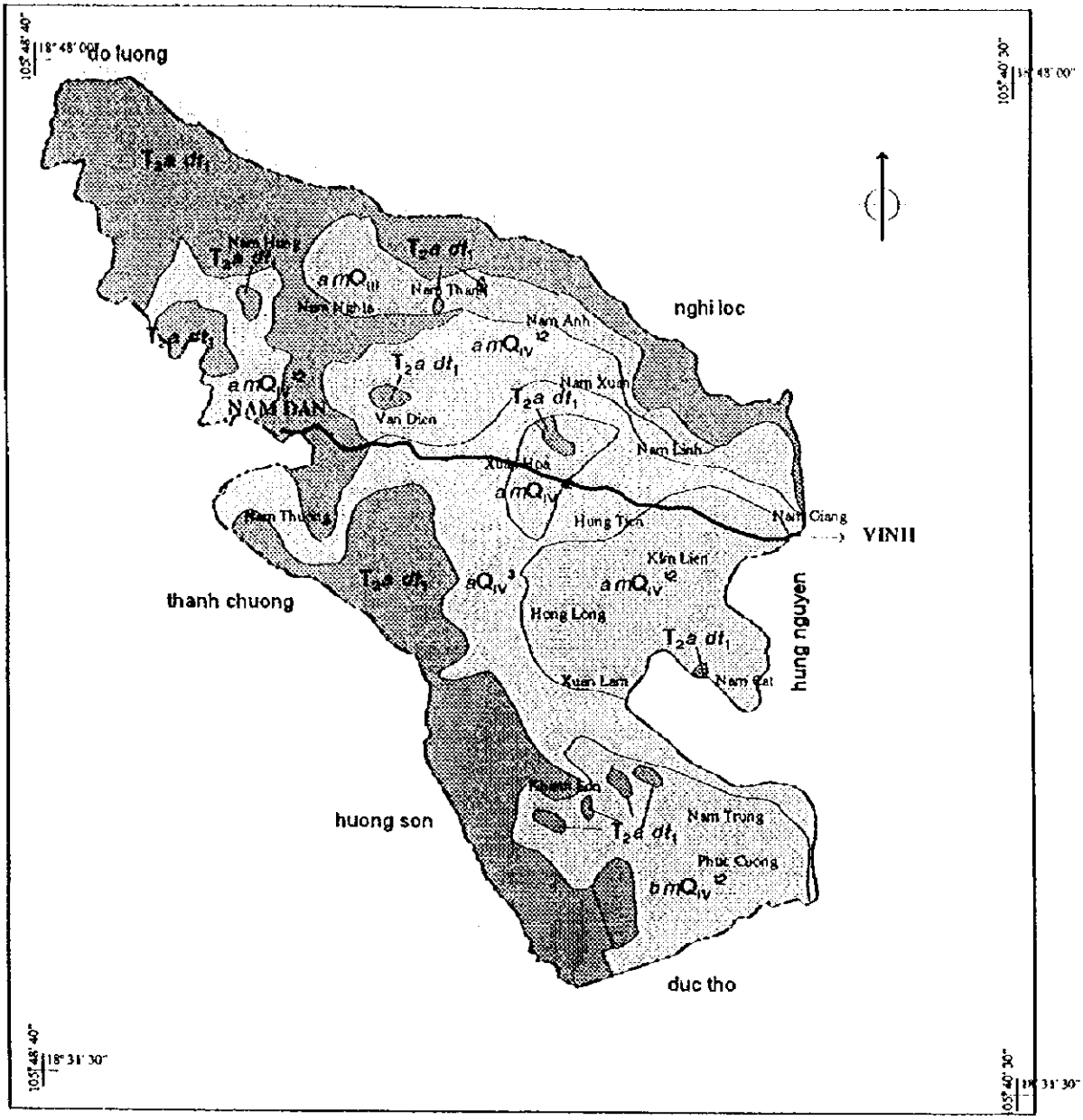
(B2) Electricity Cost
[Use : One submersible intake pump and One distribution pump]
[Electricity unit cost = 600 VND/kW]
Class A = (5.5 kW + 5.5 kW) x 20 hours x 365 days x 600 VND
Class B = (3.7 kW + 3.7 kW) x 20 hours x 365 days x 600 VND
Class C = (2.2 kW + 2.2 kW) x 20 hours x 365 days x 600 VND

(B3) Sand Replacement
[Depth of sand layer = 1.5 m]
[Frequency of replacement : Every six (6) months]
Class A = 8 m3 x 2 times/year x 40,000 VND/m3
Class B = 5 m3 x 2 times/year x 40,000 VND/m3
Class C = 3 m3 x 2 times/year x 40,000 VND/m3

(B4) Repair Cost
[Annual repair cost = 1% of total construction cost]
Class A = VND 2,404,000,000 x 1%
Class B = VND 3,341,000,000 x 1%
Class C = VND 2,511,000,000 x 1%

(B5) Others
Other cost = 10% of (B1 + B2 + B3 + B4)

APPENDIX K : FIGURES



LEGEND

- aQ_{IV}^3 — Aluvium, late holocene.
- amQ_{IV}^{1-2} — Aluvial marine deposits, Early-Middle. Holocene.
- bmQ_{IV}^{1-2} — Marine-swampy deposits, Early-Middle. Holocene.
- aQ_{III}^{1-2} — Aluvial deposits, Late pleistocene.
- Fault
- Porphyric granite, granite, granophyr, Middle-late Trias, SongMa complex.
- $T_2a\ dt_2$ — Lime stone, marl. Middle Trias, upper DongTrau formation.
- $T_2a\ dt_1$ — Sandstone, conglomerate, silstone, shale, porphyr ryolit. Middle-trias DongTrau formation.
- $O_3-S_1sc_2$ — Sericite, schist, Late Ocdovic-Early Silur SongCa formation
- Road

Fig. K. 2.1 Geological Map of the Study Area

LEGEND

- aQ_V^3 — Aluvium, late holocene.
- amQ_V^{2-3} — Aluvial marine deposits, Early-Middle. Holocene.
- bmQ_V^{2-3} — Marine-swampy deposits, Early-Middle. Holocene.
- aQ_V^{1-2} — Aluvial deposits, Late pleistocene.
- Fault
- Porphyric granite, granite, granophyr, Middle-late Trias, SongMa complex.
- $T_2a\ dt_2$ — Lime stone, marl, Middle Trias, upper DongTrau formation.
- $T_2a\ dt_1$ — Sandstone, conglomerate, silstone, shale, porphyr ryolit, Middle-trias DongTrau formation.
- $O_3S_1sc_2$ — Sericite, schist, Late Ocdovic-Early Silur SongCa formation
- Road

Fig. K. 2.1 Geological Map of the Study Area

BOREHOLE LOG

Well Ident	Description
JICA-1	*Drilling to ground water exploration*

Location			
Nam Kim - Nam Dan - Nghe An			
X	Y	Z	Meas. Pt. Elev.
Water Level (m, MSL)	Drilling Date of start		Drilling date of completion

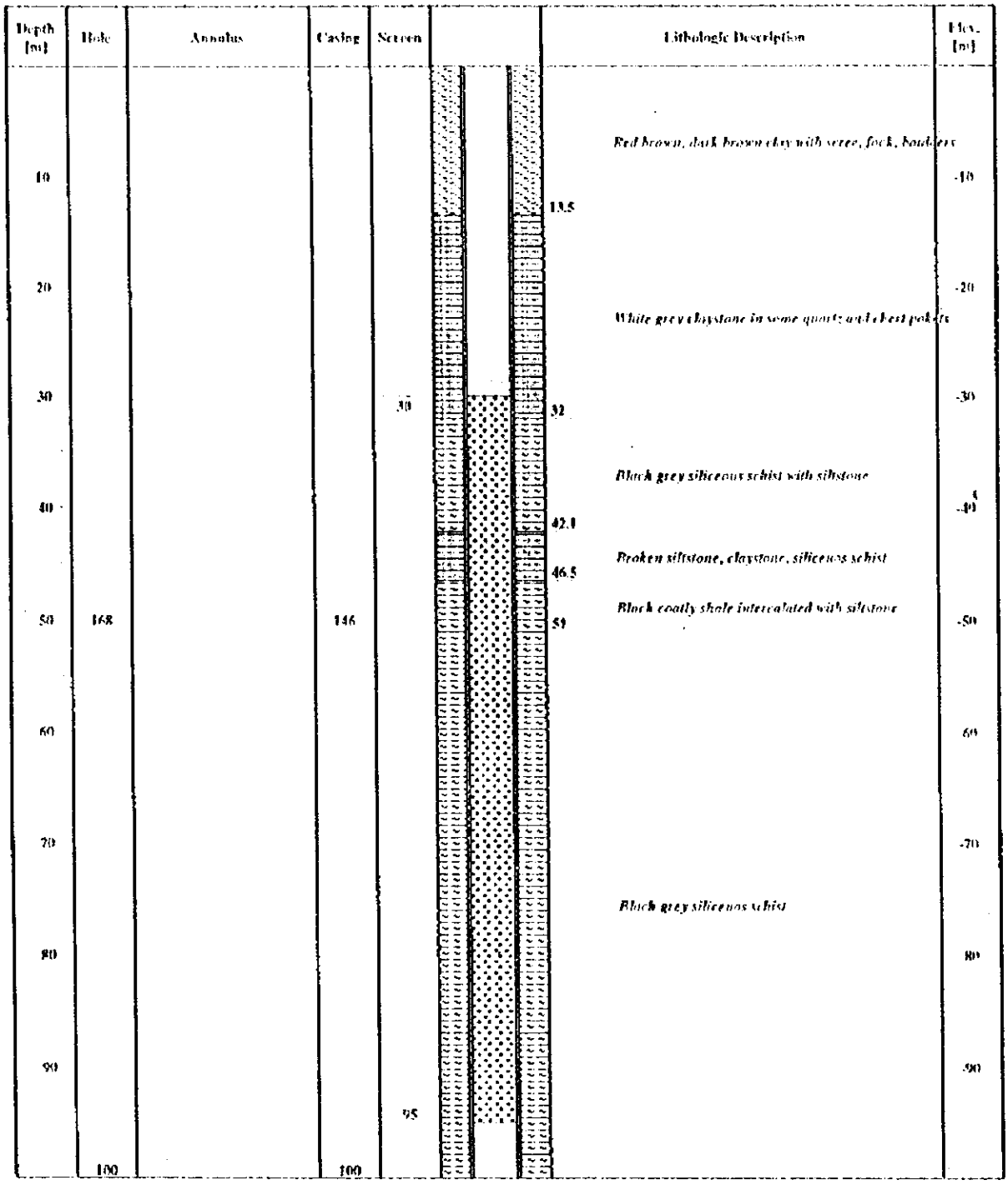


Fig. K.2.2 (1/6) Borehole Log (JICA No.1)

BOREHOLE LOG

Well Ident	Description
JICA-2	*Drilling to groun Lwater exploration*

Location			
Nam Trung - Nam Dan - Nghe An			
X	Y	Z	Meas. Pt Elev.

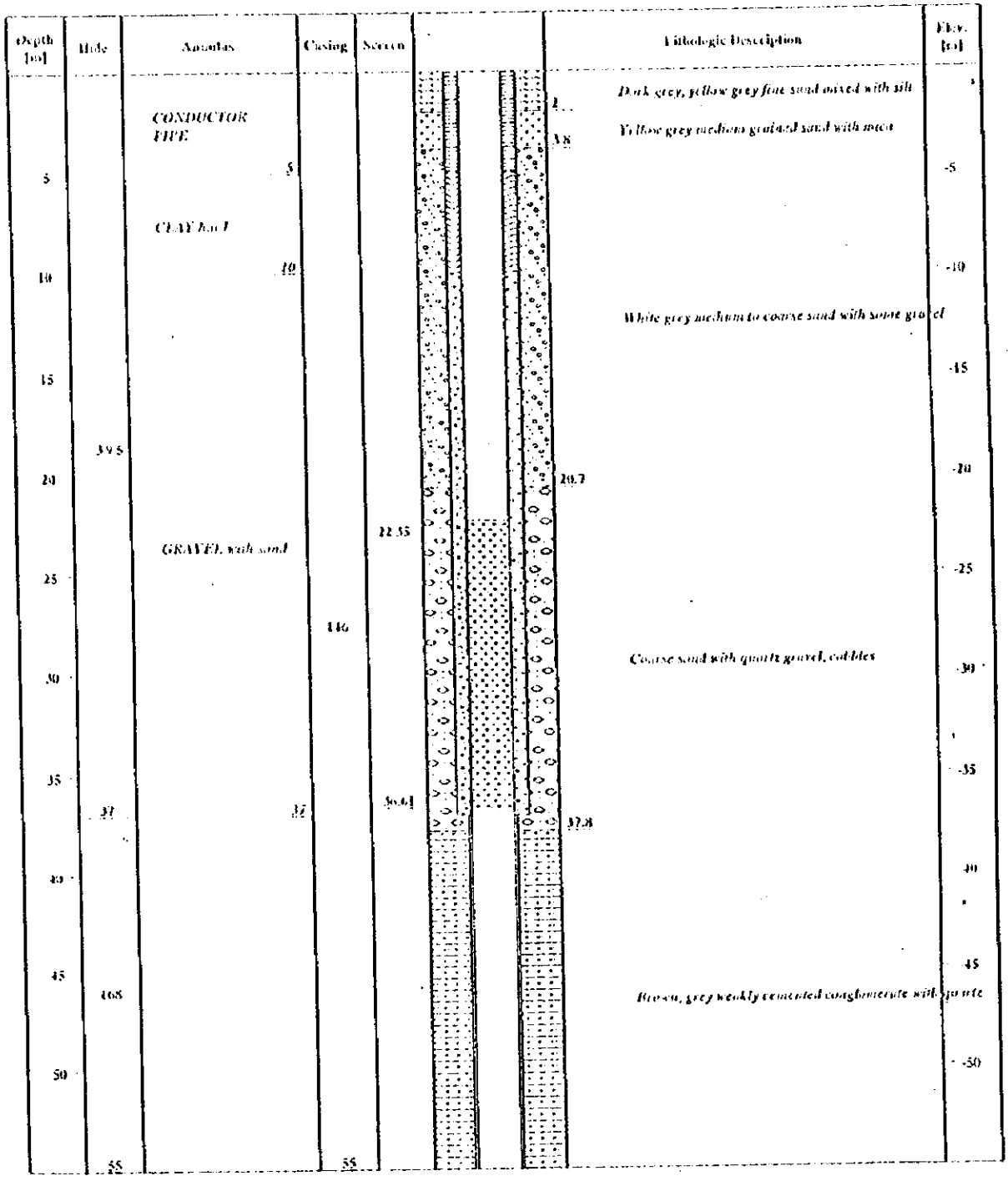


Fig. K.2.2 (2/6) Borehole Log (JICA No.2)

BOREHOLE LOG

Well Ident	Description
JICA-3	*Drilling to ground water exploration*

Location			
Khanh Son - Nam Dan - Nghe An			
X	Y	Z	Meas. Pt. Elev.
Water Level (m, MSL)	Drilling Date of start	Drilling date of completion	

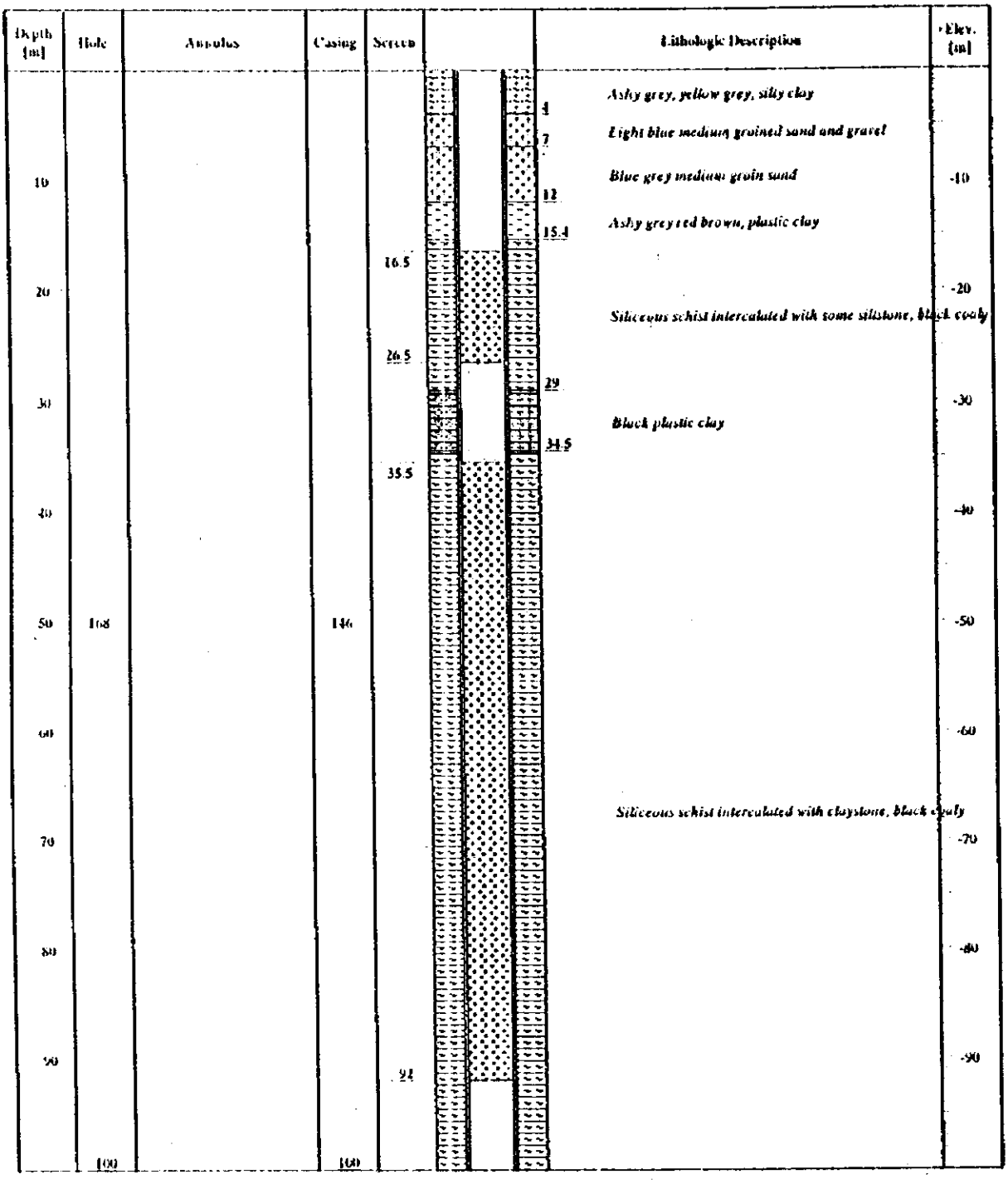


Fig. K.2.2 (3/6) Borehole Log (JICA No.3)

BOREHOLE LOG

Well Ident	Description
JICA-4	*Drilling to ground water exploration*

Location			
Nam Nghia - Nam Dan - Nghe An			
X	Y	Z	Meas. Pt. Elev.

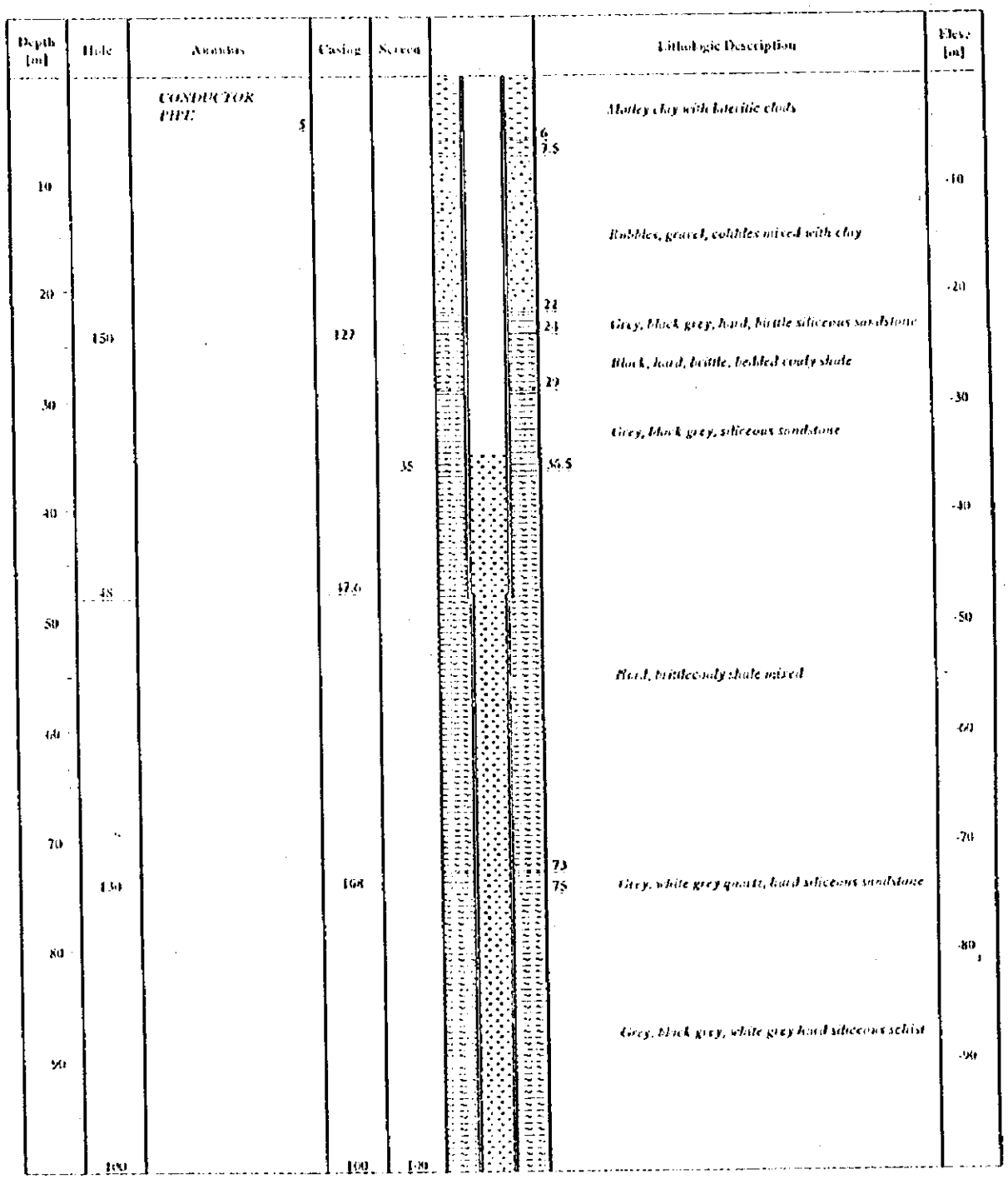


Fig. K.2.2 (4/6) Borehole Log (JICA No.4)

BOREHOLE LOG

Well Ident	Description
JICA-5	*Drilling to ground water exploration*

Location: *Kim Lien - Nam Dan - Nghe An*

X	Y	Z	Meas. Pt. Elev.

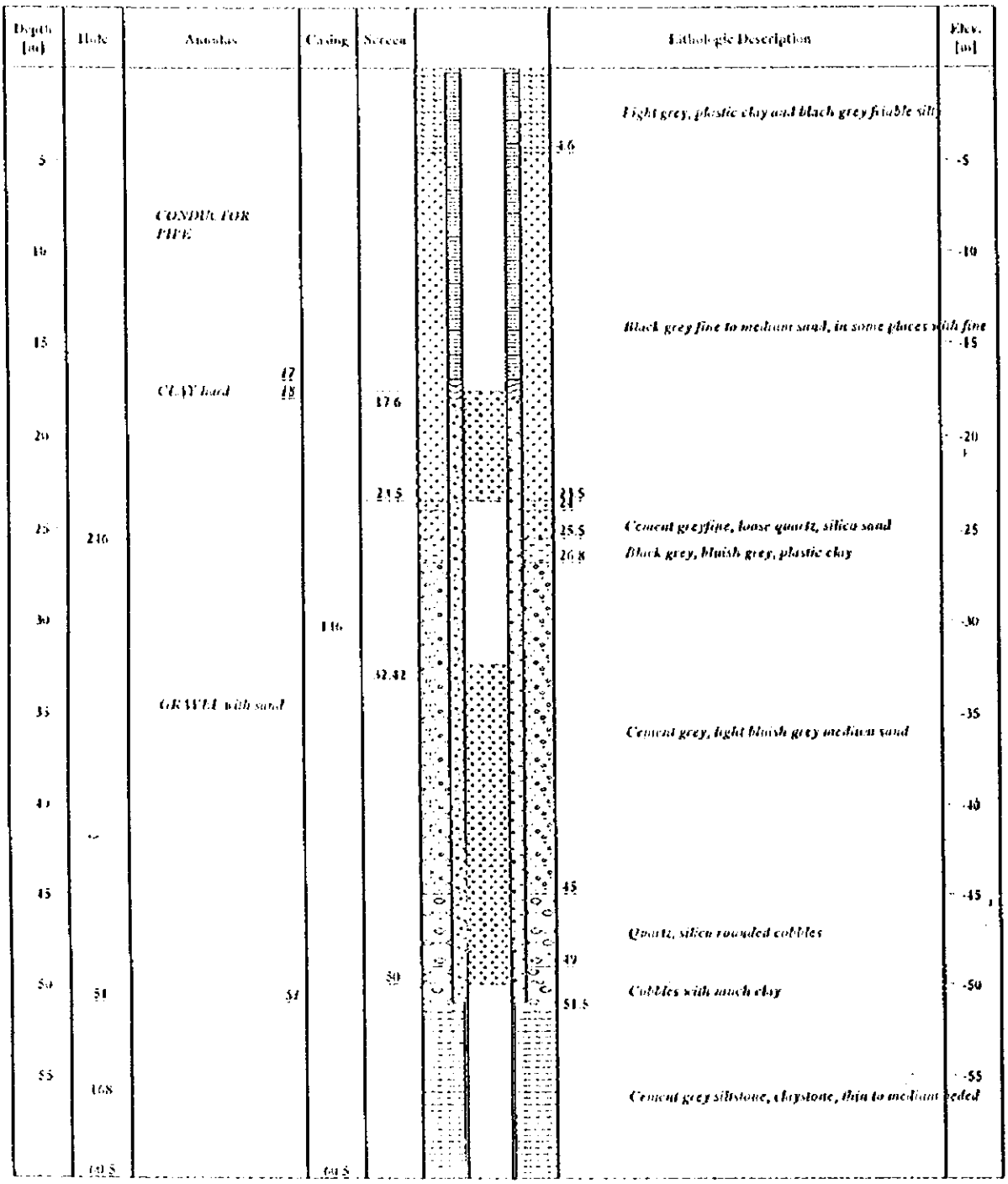


Fig. K.2.2 (5/6) Borehole Log (JICA No.5)

BOREHOLE LOG

Well Ident	Description
JICA-6	*Drilling to ground water exploration*

Location			
Nam Xuan - Nam Dan - Nghe An			
X	Y	Z	Meas. Pt. Elev.
Water Level (m, MSL)	Drilling Date of start	Drilling date of completion	

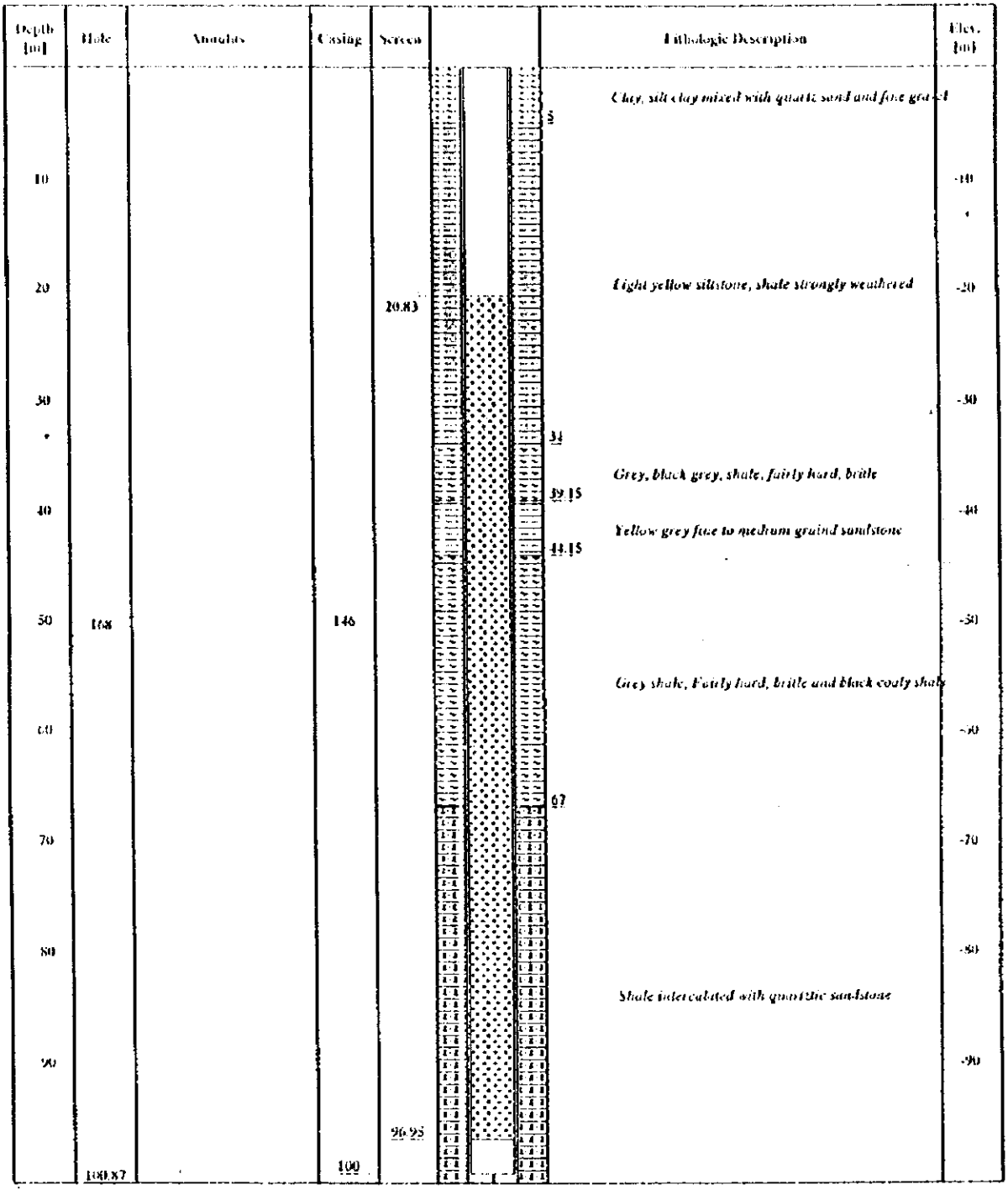


Fig. K.2.2 (6/6) Borehole Log (JICA No.6)

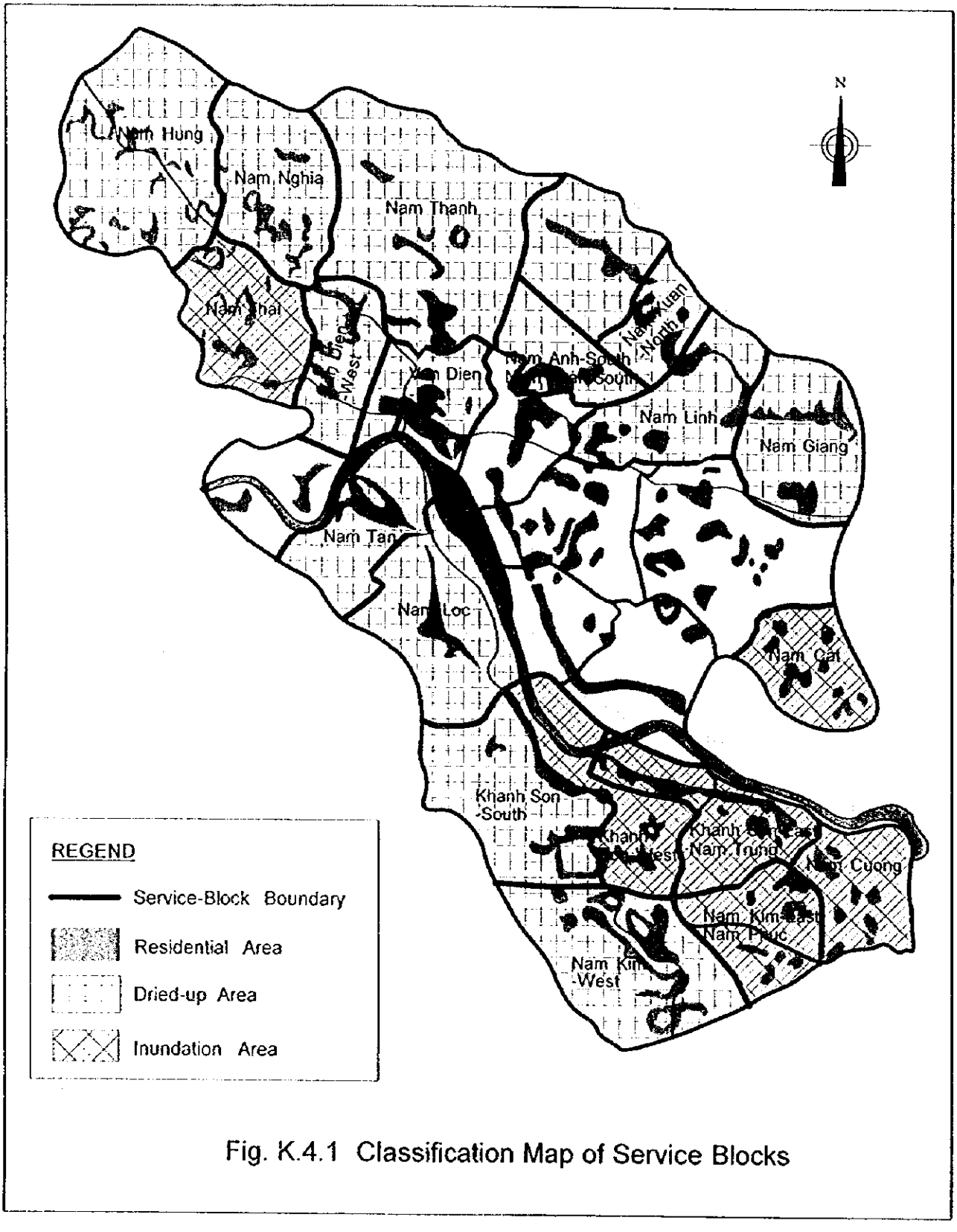


Fig. K.4.1 Classification Map of Service Blocks

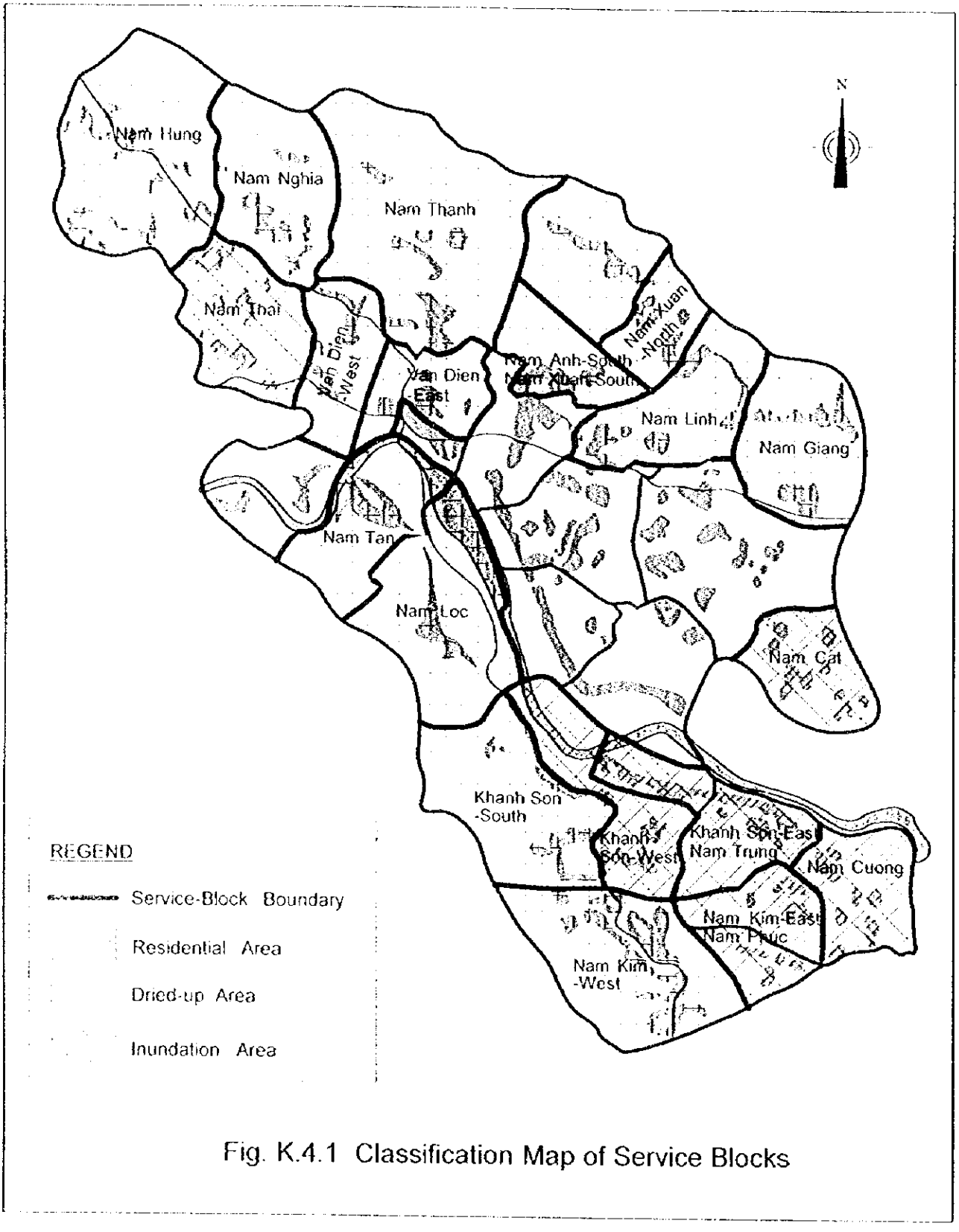


Fig. K.4.1 Classification Map of Service Blocks

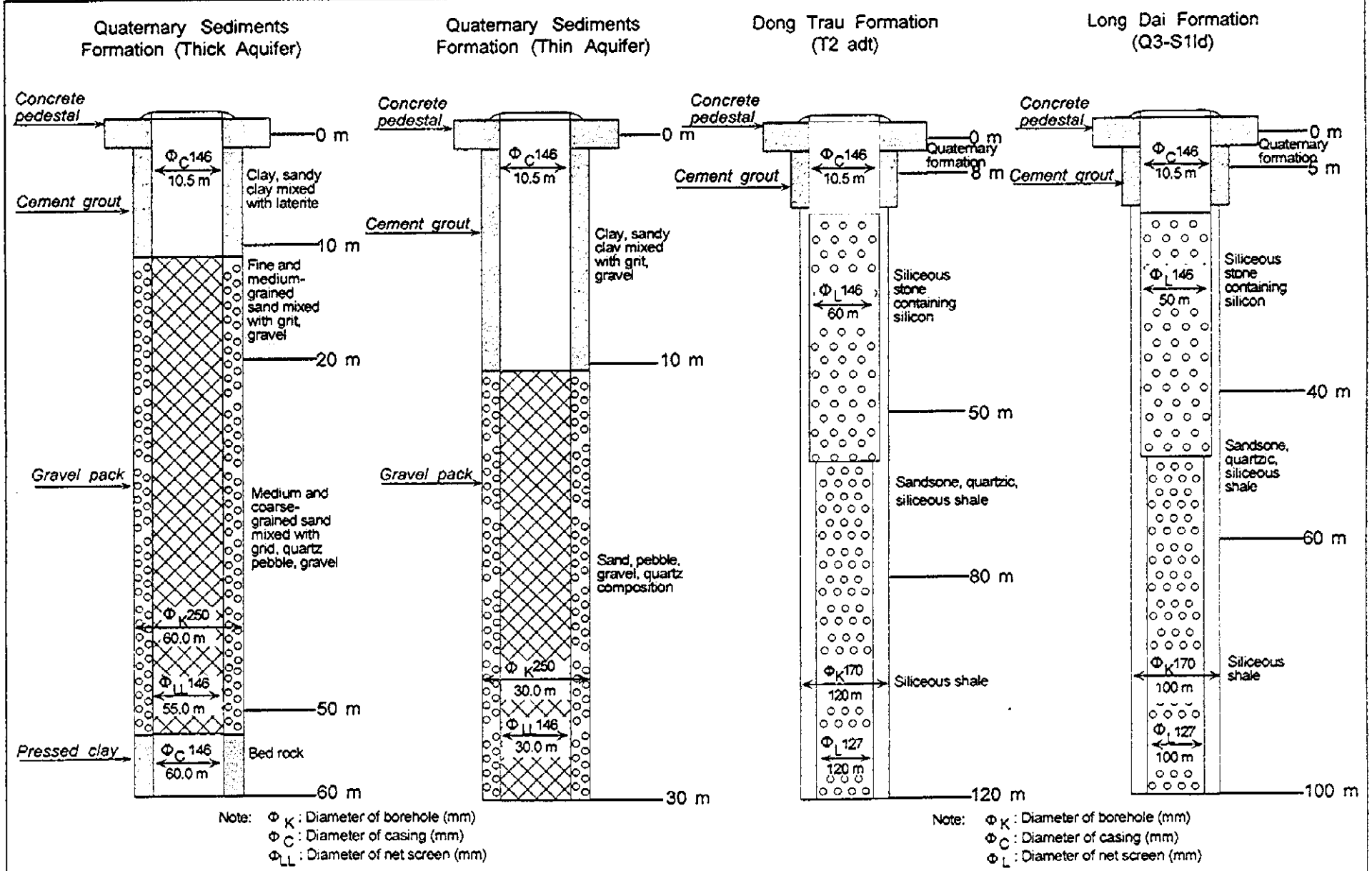


Fig. K. 4. 2 Standard Well Structur

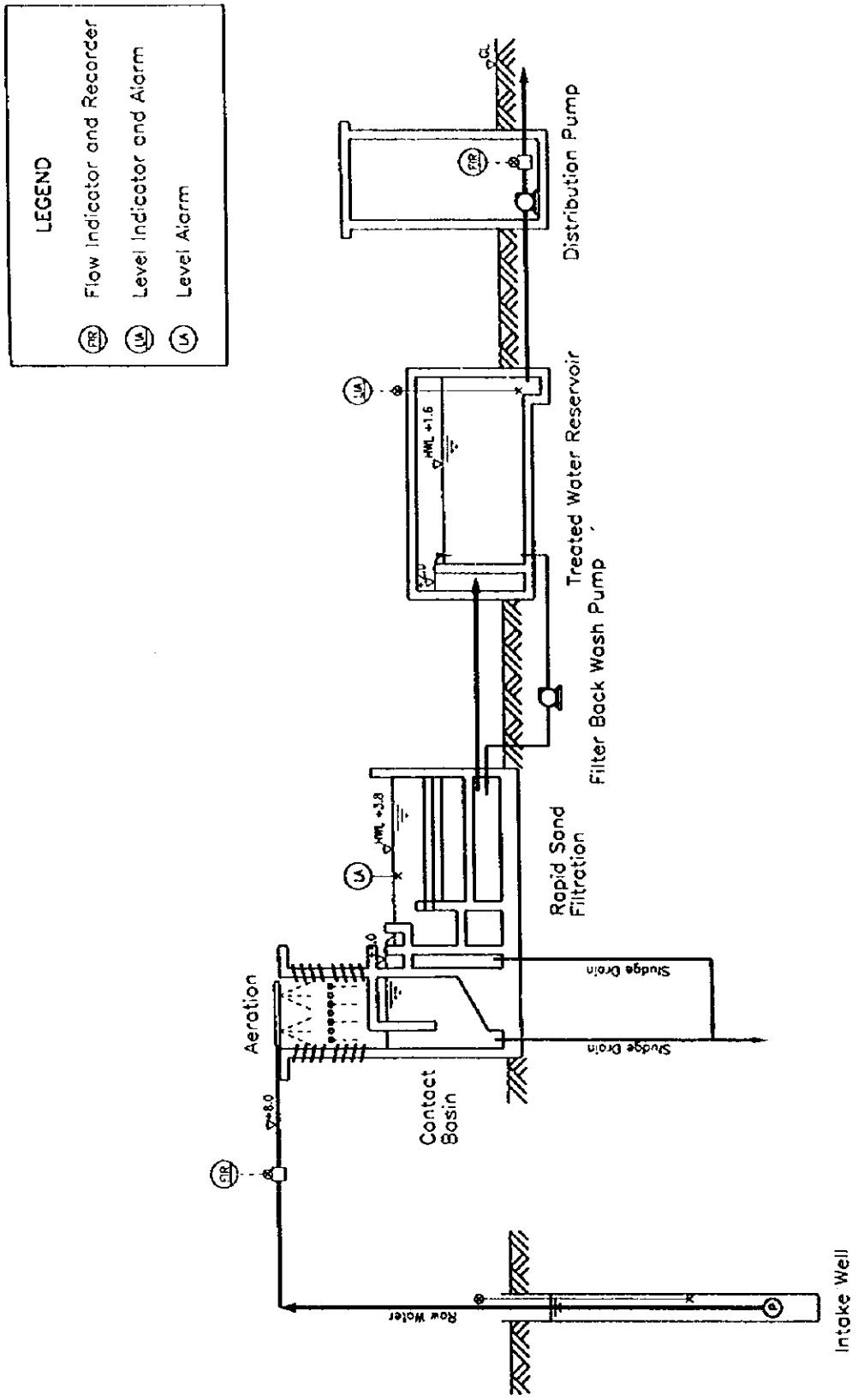
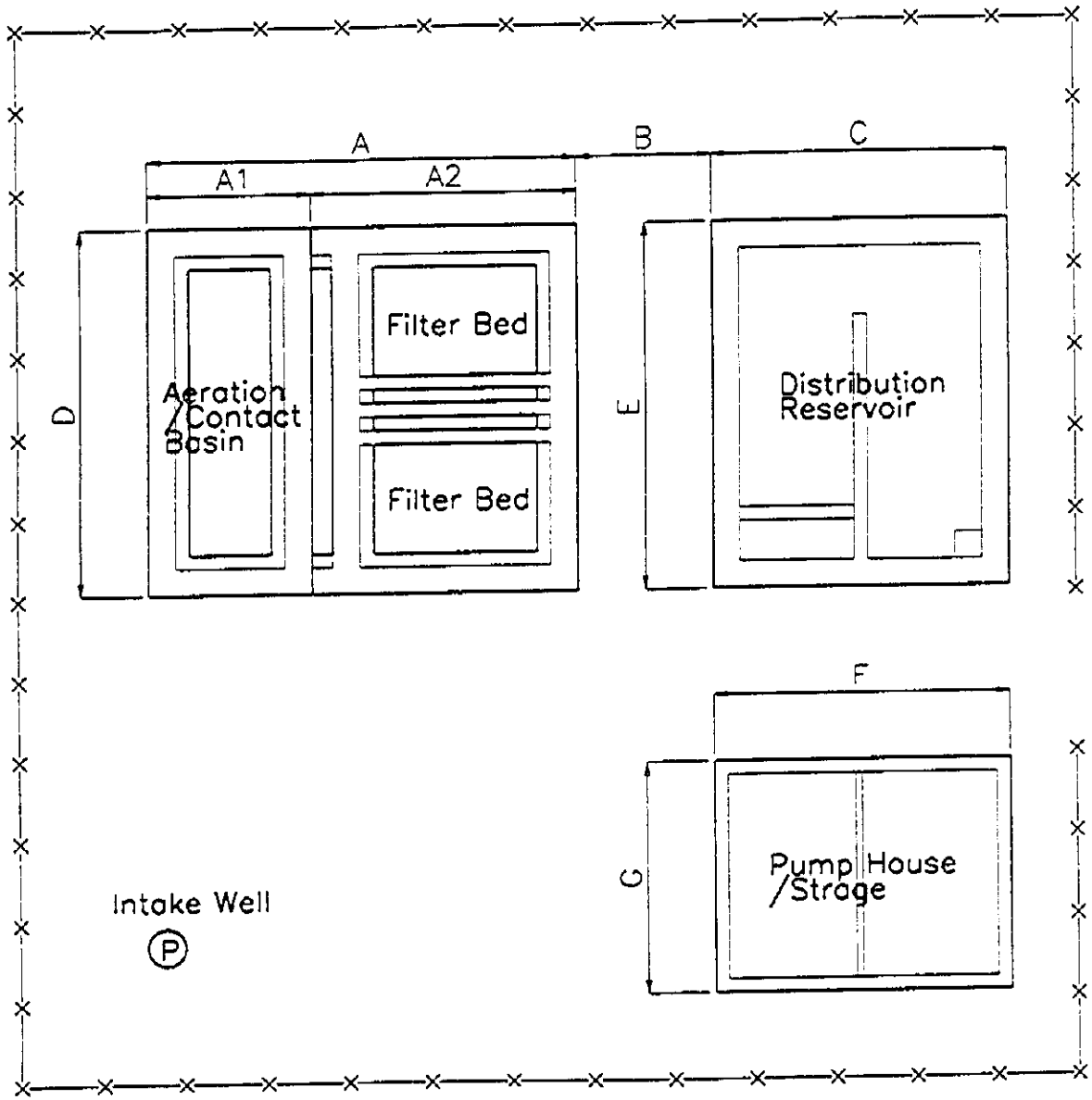


Fig. K.4.3 Treatment Facility Flow Sheet



	Class A	Class B	Class C
A	6500	5300	5300
A1	2400	2200	2200
A2	4100	3100	3100
B	2000	2000	2000
C	4400	3400	3400
D	5800	5800	3800
E	5800	5800	3800
F	4400	4400	4400
G	3400	3400	3400

Fig. K.4.4 Tentative Layout of Treatment Facility

APPENDIX L : ENVIRONMENT

THE STUDY
ON
MODEL RURAL DEVELOPMENT
IN
NAM DAN DISTRICT, NGHE AN PROVINCE

FINAL REPORT

APPENDIX-L ENVIRONMENT

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APPENDIX-L ENVIRONMENT

L.1 INTRODUCTION

At present, Vietnam is facing with serious environmental problems such as deforestation, degradation of land resources, inefficient conservation of fresh water, fresh water shortage, over-exploitation of biological resources and increasing of environmental pollution. These situations are currently experiencing severe pressure from a rapidly increasing population and poverty.

Thus, when implementing the development project, it is necessary to foresee the environmental problems that development will bring, and take the necessary precautions in advance to mitigate them by developing an environmental sustainable development strategy, through the sustainable utilization of nature resources, and the participation of the majority of the inhabitants of the Project Area.

L.2 RELEVANT LAWS AND CONVENTIONS

Like other many developing countries, Vietnam is now facing critical issues of the degradation of its natural resources and a decrease in environmental quality. Since the end of the Second Indochina War, the Vietnam people and Government have undertaken efforts to develop the economy and to conserve resources and protect the environment as well. A National Conservation Strategy was prepared in 1985 and since then a National Action Plan for the Environment and Sustainable Development has been developed and partly implemented. On the basis of this national plan, various activities related to environmental registration, management, education, research and experimentation are being carried out in the country.

Concerning environmental legislation's and their implementation, an examination of the various laws and regulation indicates that Vietnam has made significant progress in terms of the necessary scope and clarity towards an environmental program. Environmental legislation is comprised mainly of:

(1) Law on Environmental Protection (LEP), 1993;
(2) Decree No 175 / CP, 1994 providing 'Guidance for the Implementation of the LEP';
(3) Environment-related sectorial laws;
(4) Instructions issued by Ministry of Science, Technology and Environment (MOSTE) for guiding Environmental Impact Assessment procedures;
(5) Environmental Standards.

L.2.1 Law on Environmental Protection

Law on environmental protection was ratified by National Assembly on December 27, 1993, and the statute was issued on January 10, 1994. In this law, there are very clear articles to prevent environmental pollution in general; there are also articles concerning the exploitation of agricultural land and water sources. Chapter II concerns

prevention and combat against environmental degradation, pollution and incidents. Article 14 deals with the exploitation of agricultural land, forest land and the use of chemical fertilizers and pesticides. Article 15 also deals with protection of water sources and drainage systems. Article 38 defines responsibilities for environmental management.

L.2.2 EIA (Environmental Impact Assessment) System and Procedures

MOSTE (Ministry of Science, Technology and Environment) signed the temporary guideline of EIA in September 1993. The guideline includes: general conception; contents of EIA report and determined which organizations are responsible for EIA reporting; and a schedule of approving EIA report. The Government Decree (No.175 / CP) providing a guidance for implementation of the LEP was distributed in October 1994. According to this Decree, all socio-economic development projects should be implemented accompanied by a EIA reporting.

The work of appraising report of EIA by ongoing projects and operating units is separated into two levels of the central level and the local level:

(1) MOSTE shall appraise the central level. In certain cases, MOSTE can empower a specialized branch to conduct the appraisal;

(2) The local level shall be appraised by the Department of Science, Technology and Environment (DOSTE).

The division of appraising power is shown in Table L.2.1.

The aims of EIA are as follows:

(1) Analyzing existing environmental conditions scientifically and forecasting future impact as positive, negative, direct, indirect, temporary, long-term, on natural or socio-economic environment.

(2) To set up and propose measures for mitigation of negative impact combined with optimum alternatives for sustainable development.

L.2.3 Ratification to International Conventions

The Government of Viet Nam (GOV) recognizes the importance of the participation in and the implementation of international conventions. As the GOV the assistance from international community, entry to international convention is necessary.

International conventions that the GOV has entered are as follows:
Date in [ ] shows the entry year of Vietnam government.

(1) Convention on Wetlands of International Importance Especially as Waterfowl Habitat (RAMSAR), [Sep 20, 1988]

With accession this convention one wetland site was designated on March, 1989 as Wetlands of International Importance Site, namely,

Xuan Thuy area (Nam Ha Province)

Xuan Thuy area locates in the Red River Delta of about 80 km in the direction of east-south from Hanoi. The area is 2,300 ha and mangrove, waterfowl and migratory birds inhabit.
Also, Cua Song Hong area (Thai Binh Province) is proposed as new wetland of international importance site.

(2) Convention concerning the Protection of the World Cultural and Natural Heritage, [Oct 19, 1982]

With accession this convention two historical sites were designated as World Heritage Sites, namely;

1) Halong Bay (Quang Ninh Province)
2) Hue City (Thua Thien Hue Province)

(3) Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), [Jan 20, 1994]
(4) Convention for the Prevention of Pollution from Ships (MARPOL), [Aug 29, 1991]
(5) United Nations Environmental Modification Convention (ENMOD), [Aug 26, 1980]
(6) United Nations Convention on the Law of the Sea, [Jul 25, 1994]
(7) Vienna Convention for the Protection of the Ozone Layer, [Apr 26, 1994]
(8) Convention on Early Notification of a Nuclear Accident, [Sep 29, 1987]
(9) Convention on Assistance in the case of a Nuclear Accident or Radiological Emergency, [Sep 29, 1987]
(10)Montreal Protocol on substances that deplete the ozone layer, [Jan 26, 1984]
(11)Basel Convention on the control of Transboundary Movement of Hazardous Wastes and their Disposal ,[May 13, 1995]
(12)United Nation Framework Convention on Climate Change, [Nov 16, 1994]
(13) Convention on Biological Diversity, [Nov 16, 1994]

L.2.4 National Parks and Protected Areas

(1) National Parks and Protected Areas

A list of 87 protected areas in Vietnam including 8 national parks, 50 protected areas and 29 cultural-historical and environmental reserve with the total area of 956,585 ha was announced by WWF (World Wide Fund for Nature) and IUCN (International Union for Conservation of Nature and Natural Resources) . Furthermore, two other national parks and three protected areas are proposed to become environmental reserves.
The first national park in Vietnam was established in Cuc Phuong National Park in 1962. At present, 8 national parks are established as below:

No	Name of National Park	Area (ha)	Establishment
1	Ba Be	5,000	1977
2	Ba Vi	2,144	1977
3	Bach Ma-Hai Van	40,000	1986
4	Cat Ba	27,700	1986
5	Con Dao	6,043	1982
6	Cuc Phuong	25,000	1962
7	Southern Bai Cat Tien	36,000	1978
8	Yokdon	57,500	1988
Total		199,887	

Source: Environment and Bioresources of Vietnam, 1995

National parks are the protected areas which possess profound value in nature conservation, research, cultural relic maintenance and tourist attraction. National parks are administrated and developed by Ministry of Forestry.

(2) Historical Protected Area

There are 2,102 historical protected area in Vietnam (October, 1996). These protected areas are classified in the following 4 categories.

1) Architectural and art relicts	962
2) Historical relicts	1,062
3) Landscape site	58
4) Archeological relicts	20
Total	2,102

109 sites among above sites are designated as important cultural properties of the country.

Regulation related to the protection and use of historical and cultural relics and places of interests was approved by the State Council on March 31, 1984 (Decree No.14 LCT/HDNN7).

L.2.5 The "Barren Lands" Regreening (Decree 327) Program

A reflection of the high priority accorded to the development of barren lands in Vietnam is the promulgation by the Council of Ministers of a Decree (COM Decree 327) in September 1992 which set out "Major Guideline and Policies to Utilize Unoccupied Land, Barren Hilly Areas, Forests, Denuded Beaches and Waterfront". A ten year program, coordinated by the State Planning Committee (SPC) has been launched in 1993 to implement this decree. The province, often jointly with central agency (essentially from the Ministries of Agriculture and Food Industries; Forestry; Aquatic Product and MLISA) have proposed about 1,800 projects for implementation. The primary goals of the highland portion of the Decree 327 program are to stabilize settlement village and sedentarize itinerant shifting agriculture population by developing the underutilized barren lands throughout the country with emphasis on

linking agriculture, livestock and forestry and on increasing the protection of reserved forests and head watersheds.

The Decree 327 Program have been implemented from 1993 to 1996 as Table L.2.2.

L.3 ORGANIZATIONS RELATED TO ENVIRONMENT

L.3.1 National level

The State Committee for Sciences (SCS) was restructured in October 1992 to form the Ministry of Science, Technology and Environment (MOSTE). The Law on Environmental Protection, approved by the National Assembly in December 1993, and the implementing regulations to it (Decree 175 / CP), promulgated in October 1994, sets out the function of MOSTE.

MOSTE is the main central government agency responsible for the overall environmental management in the country. The Government has instructed the sectoral ministries to include environmental protection in the mandates of their Science and Technology Departments. Except for MOSTE, sectoral ministries have direct technical links with the Provincial services for their respective sectors. Although the sectoral ministries play an important role in establishing policies, programs guidelines for investment, they are not directly in control of implementation at the field level, except for enterprises run by the Central Government. Much of the implementation responsibility rest with the provinces, and district governments.

The main environmental management activities of MOSTE include: management of research issue relating to science, technology and environment; preparation of environmental assessment of the economy and of environmental action plans; implementing the environmental protection law and its implementing decree; codification of regulation and standards; evaluating environmental impact assessments and coordination with the MPI (Ministry of Planning and Investment) and other sectional Ministries; and implementation of international conventions.
MOSTE's Department of Environment and Natural Resources, which became National Environment Agency (NEA) in 1994, has the responsibility of undertaking the public administration of environmental protection on behalf of the Minister of MOSTE.

Organization structure of environmental management in Vietnam is shown in Fig L.3.1.

L.3.2 Provincial Level

At the provincial level, many Science and Technology Committees or Department (particularly those in highly urbanized areas) have been reconstituted to form provincial Department of Science Technology and Environment (DOSTE) and, in some instances, separate Environment Committee (Ecs) were established. These agencies are chaired by the Vice-Chairman of the People's Committee and include representatives of the line department under the People's Committee. They also have

formal authority to review and comment on environment aspects of investment applications and to resolve pollution-related disputes.

L.4 PRESENT ENVIRONMENTAL CONDITIONS

L.4.1 Social Conditions

(1) Population and Residential Areas

The total population of the Study Area (hereafter referred to as the district) is 157,957 in 1995. The population increased by 10,770 people during a period 5 years (1990 to 1995) and the population growth rate has gone up to 1.44 %. The distribution of population is divided into 3 areas of mountain area, plain and right side of Lam river; mountain area has the population of 42,625, plain has 64,716 and right side of Lam river has 50,616 in 1995. Residential area is small size and spread out through the whole district.

(2) Economic Activities

Main economic activity in the district is agriculture. Agricultural population is 149,000, which represents 94 % of total population of the district. Thus, industries, commerce and other economic activities are mostly small scale size ones. The primary crops in the district are rice, maize, sweet potato, peanut and sugarcane. Rice is planted on a double cropping pattern and the total area is 13,500 ha. Maize and sweet potato are planted for feeding crop, peanut and sugarcane are planted for cash crop. However, agricultural production in the district is low due to an inadequate irrigation system, low use of fertilizers and agrochemical and antiquate agricultural technologies.

The industries in the district includes several activities such as food processing, construction materials mining and wood processing. Food processing is the representative industries in the district and include cakes, noodle, rice milling and candies. Commerce activities in the district mainly consist of retail shops, transportation and restaurants, however its scale is small.

(3) Infrastructure and Social Services

a) Transportation

Transportation facilities in the district consist mainly of road. There are 2 main branch roads of the national road No. 46 and the provincial road No. 15 A in the district. District roads and commune roads run through the district. Total length of these roads is 403 km. However, asphalt pavement road is only total 15.9 km (National road: 12.2 km, provincial road: 3.7 km). Other roads are paved by soil and gravel. Thus, the road network of the district does not function in a proper way, especially in the rainy season.

b) Water Supply

Drinking water sources in the district can be mainly divided into groundwater, river, stream and rain. Also, the existing water supply system in the district consists of tubewell and dugwell. Tube wells are used in 700 sites and dugwell are traditional well, usually less than 8 m deep and used at each household. However, much of the waters are unsuitable for human consumption due to their poor quality. The whole district suffers from water shortage, especially in the dry season. These problems are caused by an inadequate water supply system and difficulties in developing new water sources.

c) Waste water

There is not waste water treatment plant in Vinh city of Nghe An Province and domestic waste water is directly discharged into Lam river. Waste water treatment plants in the province are operated in three factories of beer, paper and textile. Thus, the most of domestic waste water, especially human waste in the district is not treated and is stored in temporary latrine. This human waste is recycled to be used as fertilizers in the fields.

d) Health Care and Services

There are 25 hospitals, 48 clinics and 463 health care stations in Nghe An Province. Nam Dan District have one hospital, 3 clinics and 24 health care stations, one at each commune. Almost all of these medical facilities are under poor condition due to age and small budget provided by the government. Several kinds of diseases are recorded in the district being malaria the most common; most of the patients live in the mountainous area of the province. In 1995, 174 malaria-related cases and 4 cases of schistosomiasis were recorded in the district. Among the many diseases in the area, diarrhea is the most serious one and it is caused by unsanitary conditions such as unsuitable drinking water and inadequate health care. Total number of diarrhea cases in the district was 229 in 1995.

e) Education

There are 32 primary schools, 18 lower secondary schools and 3 upper secondary schools in the district. Moreover, one combined lower and upper secondary school, one regular center and one vocational center are established. The enrollment ratio of these schools is higher than the average of Nghe An Province, the drop-out rate is also lower than the average for the Province. However, educational facilities, education skills of the teachers, distribution of teaching materials are not so good. One of the reasons for that situation is the lack of an adequate budget.

(4) Water Rights and Fishery Rights

Irrigation water in the District is managed under each level of province, district and commune according to the kind and scale of the facilities. The District manages headworks, pumping stations with an irrigation area of more than 200 ha, the canal network at level 1 and 2 and reservoirs. The commune also manages small reservoirs,

tertiary canals and pumping stations with an irrigation area of less than 200 ha. The management of fishery is carried out only for marine fishery. Concerning the fishery in Lam river and reservoirs, fishery rights do not exist.

(5) Ruins and Cultural Properties

There are a various kinds of ruins and cultural properties in Viet Nam with an old historical value. In the District there are 12 ruins and cultural properties. One of these sites, Kim Lien village, is protected as one of the important cultural assets in the country. Mai Hac De King Temple and Phan Boi Chau monument are also protected as cultural assets under a national-state level. Other relics are under the category of provincial level's cultural assets.

Ruins and cultural properties in the district are as follows:

No	Name of Relicts	Status
1	Kim Lien Village (Kim Lien historical complex)	Most Important relict of the country
2	Tomb of Hoang Thi Loan (Ho Chi Minh's mother)	Important relict of the province
3	Tomb of Mai Thuc Loan (King Mai Hac De)	Important relict of the province
4	Temple of Mai Hac De	Important relict of the country
5	Monument of Phan Boi Chau	Important relict of the country
6	Hoanh Son communal house	Important relict of the province
7	Tomb of Tong Tat Thang	Important relict of the province
8	Trung Can communal house	Important relict of the province
9	Hong Long temple	Important relict of the province
10	Nam Son temple	Important relict of the province
11	Thien Nhan mountain	Important relict of the province
12	Dai Hue mountain	Important relict of the province

Location map of these relicts is shown in Fig L.4.1.

(6) Minority

Vietnam has about 54 ethnic groups. Lowland Kinh (Viet) ethnic group as the major group accounts for 84 % of the total population. Other groups consist of minorities. Minorities in Nghe An Province consist of three tribes of Thai, Hmong and Muong and almost all of them inhabit in the mountain area and its surroundings. There are not minorities in the district.

L.4.2 Natural Conditions

(1) Geographical Situation

The District is in a semi-mountainous area with some mountains in north-eastern and southern parts of the District. The whole forests in the mountainous area consists of artificial forests. Total area of artificial area is 8,373 ha. Paddy field and dry field spread between the mountainous areas. Lam river flows in a south-east direction through the District area. This river is the main river in the District and supply

irrigation water to paddy fields. The region on the right side of the river has 8 communes comprising 1/3 of the population for the whole district; on the left side there are 15 communes and 1 town.

(2) Meteorology and Hydrology

Annual rainfall in the District is 2,100 mm approximately. Rain is concentrated during the hot season due to monsoon influences. The rainy season is from June to November and the dry season lasts from December to May. Thus, about 80 % of annual rainfall is observed from June to November. The monthly minimum temperature is observed as 17 °C in January, the monthly maximum temperature is 29 °C in July and mean temperature is 24 °C.

Lam river is the main river of the District with a catchment area of 22,300 km2. Annual mean discharge of the river is estimated at 500 m3/s. The highest flow season is from August to October and its discharge shows more than 800 m3/s. There are several reservoirs in the district and these reservoirs are mainly used for irrigation water. The number of reservoir consists of more than 40 sites and with a total holding capacity of 10,500,000 m3.

(3) Flora and Fauna

a) Flora and Fauna in Nghe An Province

Concerning flora of Nghe An Province, a total of 28 valuable species, which belong to endangered, vulnerable, threatened and rare species, are recorded. These species are divided into one endangered specie, 9 vulnerable species, 5 threatened species, 10 non - sufficient number species and 3 rare species. Distribution of these species are limited in the mountain area and surrounding of the province.

A variety of fauna is recorded living in Nghe An Province under rich natural environmental conditions. Valuable species in Nghe An Province consists of total 56 species. These species are divided into 20 species of mammals, 6 species of birds, 12 species of reptile and 18 species of fishes. Almost all these species inhabit in the mountainous area of the province. Endangered species includes 7 species of mammals and one specie of reptiles.

Distribution of flora and fauna in Nghe An Province are shown in Table L.4.1 and L.4.2.

b) Flora and fauna in the district

Various species of flora and fauna can be found in Nam Dan District. However, almost all these species consist of common and widespread species and valuable species are seldom found in the District.

(4) Forest Area in the District

There are some protection forest areas in the District. These forests are managed by the Forest Protection Department of Nghe An Province. Protection forests are located in the mountainous area along the boundary of the District. All of these forests are covered with artificial forests, which almost all of them consist of pine, acacia and eucalyptus. Forest area are divided into 3 areas: special use forest, protection forest and production forest. Special use forests are designated for protected area of relief. Protection forests have the functions of protection of land slide and forest reserve. Total area of protection forest is 7,706 ha (Protection forest area: 3,870 ha; and production forest area: 3,231 ha; Special use forest area: 605 ha). However, all of these forest areas are not covered with woody land. Woody land area is 4,394 ha, which is 57 % of the total forest area. Other forest area consists of barren land and its area is 3,312 ha (43% of the total area).

Unit: ha

Area	Total area	Forest area	Barren area
Production forest area	3,231	2,094	1,137
Protection forest area	3,870	2,002	1,868
Special use forest area	605	298	307
Total	7,706	4,394	3,312
(%)	100	57.0	43.0

Source: Dai Hue State Farm

(5) Environmental Condition in Estuary of Lam River

Annual mean discharge in the estuary of Lam river is estimated at 500 m^3/s. The coastal line of both sides of the river is natural coast with superior landscape. Thus, this area includes one of the important resorts in the country and some resort hotels are established. In the left bank, near the estuary, mangrove can be found. Mangrove forest has the area of about 100 ha and is designated as protection area of district level. Mangrove area consists of two areas of natural mangrove area 60 ha and plantation mangrove area 40 ha. Plantation of mangrove are to prevent river erosion and to preserve waterfowl and fish. No coral reefs near the estuary have been observed.

L.5 ENVIRONMENTAL CONSERVATION

The flat lands in the District almost consists of cultivated lands, therefore serious environmental problems are not observed. However, the mountain areas in the District faces the environmental problems such as barren land and gully erosions.

(1) Environmental Issues in the District

The District faces serious environmental problems such as decrease of forest in the mountain area and soil erosion in barren lands. Mountain areas in the District occupy total 7,706 ha of the land, however forest area have decreased to 4,394 ha (57%) in 1995 due to forest degradation by expansion of agricultural land, fuelwood

consumption, commercial logging and war damages. The remaining 3,312 ha (43%) consists of barren lands. Forests in the District are covered with artificial forests, which almost all of them consist of pine, acacia and eucalyptus. Forest areas are classified into 3 types namely special use forest, protection forest and production forest. Forest area and barren area for each classification are summarized as follows:

Forest Areas in the District in 1995 Unit: ha

Area	Total area	Forest area	Barren area
Production forest area	3,231	2,094	1,137
Protection forest area	3,870	2,002	1,868
Special use forest area	605	298	307
Total	7,706	4,394	3,312
(%)	100	57.0	43.0

Source: Nam Dan Afforestation Yards

(2) Necessity of Forest Conservation

Decrease of forest area changes the run-off characteristics of basin related to flooding and causes problems such as soil sedimentation at low land due to daily soil erosion. At the same time, recovery of forest becomes difficult due to soil erosion and the change to thin layer of surface soil in mountain area. Therefore, effective countermeasures should be taken against forest conservation and prevention of soil erosion in mountain area.

(3) Forest Conservation Plan in Nam Dan District

At present, forest lands in the District are managed under the classification of special use forest, protection forest and production forest. Felling of trees in protection forest areas is controlled completely; land use in special use forest area and production forest area are also regulated to prevent from unplanned development. These regulations have recently shown their effects in Nghe An Province and Nam Dan District. Also, the "Barren Lands" Regreening Program (hereafter referred to as the Decree 327 program), that is the national program for forest regeneration, had been carried out by Vietnam government since 1993. The afforestation in the District also has been conducted by afforestation yard. The results of afforestation in the District is shown in the Table below and Fig L.5.1.

Achievement and Plan of Afforestation in Nam Dan District

	Achivement				Plan				
Year	1993	1994	1995	1996	1997	1998	1999	2000	Total
Area (ha)	67.60	84.70	192.00	339.85	(450)	(500)	(500)	(500)	-
Sub-total	684.15				(1,950)				2,634.15

Source: Department of Agriculture and Rural Development

According to the Decree 327 program, afforestation in barren lands of the District will be completed by the year 2000. The afforestation by Decree 327 program should consider the following items.

1) Afforestation in barren lands by Decree 327 program is very important for environmental conservation of District. Therefore, provision of necessary budget and adequate staff should be made for the implementation of the proposed afforestation plan.

2) There are many reservoirs in the District. Some of them are located in barren land or in hinterland. In the rainy season, the storage capacity of these reservoirs may decrease due to soil sedimentation. Therefore, trees with stronger water retaining capacity should be planted in hinterlands.

3) A total 40 ha of forest areas in the District was lost due to the damage caused by harmful insects and forest fire in 1996. Damage by harmful insects covered 38 ha, most of them were covered with pine. Also, it is reported that cattle caused damage to saplings. Therefore, the expansion of these damages should be avoided by the implementation of a stronger monitoring.

(4) Aims of Environmental Conservation Project

The basis of forest conservation is to carry out simultaneously the regulation for land use and forest generation program to attempt the reduction of population pressure against the forest. However, afforestation in barren lands for forest generation requires a long term until its values are expected. Therefore, the aims in the environmental conservation plan are to reduce direct damages against fortune and farm land by erosion as short period's countermeasure with assistance to afforestation plan throughout the prevention of run-off of surface soil in barren lands and lands after afforestation.

(5) Project against Gully Erosion

The project is to carry out protection works against large-scale gully erosion that needs urgent countermeasures. There are 3 erosion sites that need emergency countermeasures in the District. These sites are located in Khanh Son commune at the foot of the mountain along the provincial road No.15 A. These location are shown in Fig L.5.2. Present conditions of gully erosion in 3 sites are summarized as follows:

No.1 erosion site: This erosion was originated from bombing during the Indochina War. Since then, this erosion have developed to the present scale. The profile of this erosion is about 50 m long, maximum 10 m wide in cross section and maximum 6.5 m deep. In rainy season, soil run-off often covers the provincial road No.15 A. There is a residential house located at the point about 10 m from the erosion site.

No.2 erosion site: This erosion is in a small scale, however it is located on the steep slope of about 45 degrees in the mountain. Therefore, this erosion has the possibility of becoming wider and deeper. The present scale of this erosion is about 70m long, 5 m wide in the cross section and 3 to 5 m deep. A residential house is located at the point about 5 m from the erosion site.

No.3 erosion site: This erosion is the biggest among the 3 sites. The profile of this erosion is about 60 m long, a maximum 25 m wide in the cross section and maximum 10 m deep. There is a residential house at the point about 7 m from erosion site. When inhabitants settled in the present location in 1990, scale of gully was about 10 m wide.

On the other hand, countermeasures against small-scale gully erosions should be taken before the erosion develops. Small gullies of 0.5 - 1.5 m width are possible to be stabilized by works carried out by local residents. Also, protection works can be carried out using easy-to-implement methods such as stone masonry work, fence weir and vegetation works. Therefore, these works should be conducted by local inhabitants under the direction by specialists.

L.6 INITIAL ENVIRONMENTAL EXAMINATION (IEE)

Main objective of IEE is to evaluate whether EIA (Environmental Impact Assessment) is necessary for the further study. Table L.6.1 summarizes the estimation of the environmental changes and assessment of the influence by the change. These environmental items apply corresponding to "Environmental Guideline for JICA's Development Study on Agricultural and Rural Development Projects".

Environmental items for examination against development plan are discussed as follows:

L.6.1 Social Environment

Development plan seldom affects: 1)social aspects; 2)demographic issues; 3) economic activities or socio-economic issues. The reason is that main economic activities in the district are agriculture-related and most of the inhabitants in the District are farmers who can be benefited by the rural development. Also, average annual population growth rate in the district is 1.4 % and this is lower than that of Nghe An Province (2.5%). This trend is estimated to prevail for the time being.

Concerning the item "(2) Involuntary resettlement" of the category "1) Social aspects" in the table above mentioned, there is the possibility that some of the inhabitants may have their lands and houses are expropriated partially due to the expansion of road width. Also, 8 residential houses will be obliged to move out due to the establishment of new pumping station. Nevertheless, its effects should be kept at a minimum and supporting measures such as land guarantee for those affected should be given.

For items "(11) Adjustment of regulation of water or fishing rights" and "(12) Changes in social and institutional structures" of category "4) Institutional and Custom related Issues", these will be affected by the development plan.

As an irrigation drainage plan including rehabilitation of irrigation canals, rehabilitation/construction of reservoirs and rehabilitation/construction of pumping stations are proposed, there will be a change in water requirements. Thus, irrigation

networks will need adjustment of water rights. It is necessary to see that the beneficiaries are not affected negatively.

According to the agricultural supporting plan, establishment of agricultural machinery supply center, reinforcement of supply system of agricultural materials and farmers' organizations are proposed. Social structures such as farmer's organizations will be needed.

Concerning the health and sanitation items "(15) Outbreak of endemic diseases" and "(16) Prevalence of epidemic diseases", they should be paid attention. In the District, 4 schistosomiasis and 174 malaria cases were recorded in 1995. Thus, specific consideration is required regarding the inadvertent creation of habitats of pathogenic insects due to irrigation development.

According to the farming program, utilization of agrochemical in the development plan is almost the same as the present level. Thus, the items "(14) Increased use of agrochemical" and "(17) Residual toxicity of agrochemical" should not be a problem.

The 12 ruins and cultural properties found in the District including Kim Lien Village, which is an important cultural asset in the country, will not be affected by the development plan as no works are carried out at those sites.

L.6.2 Natural Environment

Most of the District consists of cultivated land such as paddy field and upland field and artificial forests of pine, acacia and eucalyptus. Thus, valuable species and endemic species are seldom found in the District. Lam river has a mangrove forest of 100 ha near its estuary. However, this mangrove will be not directly affected by the development plan. Also, no coral reefs can be found near the estuary.

Soil erosion should be paid attention. At present, some erosions are observed at the foot of the mountains in the district and most of these erosions are gully erosion. As the development plan needs a large quantity of soil due to road plan, reservoir plan and flood protection plan, excavation works and post-excavation treatment of materials should be carried out using a suitable construction method to avoid future soil erosion.

The development plan does not affect hydrological conditions, water quality, water temperature and atmosphere; however, soil sedimentation at the irrigation facilities sites should be considered. Especially, the storage capacity of the reservoirs with barren land in hinterlands may decrease due to soil sedimentation.

L.6.3 Conclusion and Recommendation

Based on the results of the study, the degree of the possible impact is assessed using the following three categories.

A: Impact is deemed strong

B: Some impact
C: Impact is very small

Table L.6.1 summarizes the estimation of the environmental changes and assessment of the influence by those changes.

The results of IEE are as follows:

(1) 41 items out of a total of 47 items are evaluated as falling into the "C" category.
(2) 7 items are evaluated as falling into the "B" category.
(3) No item is evaluated as falling into the "A" category.

Thus, it is concluded that due to the reasons explained below, the environment will not be seriously affected by the implementation of the development plan. As a consequence, an EIA is not necessary for further stages of the study.

The reasons supporting the conclusions are as follows:

(1) Most of the Study Area consists of cultivated land and artificial forests. Thus, the implementation of the development does not directly affect the environment, especially concerning valuable species and protected areas.

(2) An agricultural development plan is proposed with rehabilitation or renovation of existing facilities, especially irrigation facilities. Thus, the implementation of the development does not seriously affect the environment.

(3) Main economic activity in the District is agriculture. Agricultural population represents 94 % of total population of the District. Thus, rural development benefit almost all the inhabitants and the implementation of the development does not seriously affect the social environment.

(4) There is the possibility that some of people may be obliged to move out of their houses due to the expansion of the road width. However, these can be directly benefited by the expansion of the road width; this problem also can be solved with a proper land guarantee for those who are affected. Also, the resettlement of 8 residential houses are planed due to the establishment of new pumping station, however this problem also can be solved with a enough resettlement guarantee and their living guarantee.

However, the excavation of soil material and soil erosion should be paid attention. At present, there are some former sites of excavation for soil material in the District. These sites are located at the foot of the mountains and soil erosion may be originated from these sites.

Soil material is needed for the following projects.

(1) New road construction and rehabilitation of existing roads
(2) Rehabilitation/renovation and new construction of reservoirs

(3) Rehabilitation/renovation and new construction of dikes for flood control

Thus, regulations related to excavation and the implementation of monitoring activities are needed for protection against future soil erosion.

L.7 PRIORITY PROJECT

(1) Objective of Protection Works against Gully Erosion

Fundamental countermeasures to maintain living conditions of the inhabitants consist of forest conservation through afforestation, etc. However, it takes a long time to wholly implement the forest conservation measures. Therefore, urgent countermeasures in the Project, protection works against gully erosion were proposed to keep the safety of residential houses, roads and farm lands. These sites are located in dangerous places that cause damages due to the large-scale gully. The proposed works consist of simple weirs using gabions to be established in the existing gullies and decrease of stream by smoothing the stream slope which can stabilize the development of gullies.

Also, this works becomes the model for works to be performed at other erosion sites.

(2) Summary of Project

1) Location of protection works against gully erosion

There are 3 sites in Khanh Son commune where protection works against gullies erosions should be implemented. In these sites, living conditions of the inhabitants are seriously affected by gully erosion, therefore urgent countermeasures are needed. Countermeasures are impossible to be completely implemented by the inhabitants alone due to the large scale of the gullies (See Fig L.5.2).

2) Method of works

Protection works against gully erosion are planned by employing the method of gabion works (See Fig L.7.1). Gabion stores soil in the gully and stabilizes the development of the gully. The summary of the protection works is as follows:

Summary of Protection Works Against Gully Erosion

Site name	Present scale of gully (m)			Gabion works		
	Length	Width	Depth	Method	Number of weir	Volume of Gabion (m3)
No.1 Erosion site	50	10	6.5	Gabion	2	838
No.2 Erosion site	70	5	3 to 5	Gabion	5	1,177
No.3 Erosion site	60	25	10	Gabion	2	3,111
Total volume of gabion						5,126

(3) Implementation Schedule

At present, the Department of Forest Protection under the District People's Committee conducts protection works of the mountain forests and these works consist of countermeasures for forest fire, harmful insects and conservation against soil erosion. Therefore, the implementation of the project could be carried out by the Department of Forest Protection. Also, the works should be conducted in the dry season of the next year considering the preparation period of design and bid. The works are suitable to be conducted after the completion of rural roads in view of the transportation of construction materials.

(4) Project Cost

Project cost of protection works against gully erosion is as follows:

	L/C (mill.VND)	F/C (mill.VND)	Total (mill.VND)
Protection works against gully erosion	1,929	144	2,074

Remark: Engineering cost, reserve fund are included in project cost and a rise in prices is not considered.

Gabion for protection works of galley is a permanent structure that stores soil in the gully and has the function of stabilizing the development of the gully. Therefore, O/M against the main body and treatment against silted deposition in the upper stream of gully is not needed like in the case of a dam.

L.8 RECOMMENDATION

Serious environmental problems are not observed in the District at present and is considered that they will not be found during and after the implementation of the Project. The following reasons are adopted for supporting the above conclusion:

(1) Most of the District consists of cultivated land and artificial forests.
(2) Rural development plan includes mostly rehabilitation or renovation of existing facilities.
(3) Main economic activity in the District is agriculture. Thus, rural development will benefit almost all the inhabitants.

However, protection works against gully erosions were proposed as a priority project within the environmental conservation plan. The reasons proposed are as follows:

(1) There are residential houses near erosion sites, therefore urgent countermeasures are required to maintain the safety of the inhabitants.

(2) Small-scale gully erosions are observed in many places in the District. These gullies erosions are highly probable to appear during the rainy season. Therefore, the protection works as a priority project becomes the model for works to be performed at these erosion sites.

Also, countermeasures concerning the following items should be considered from the view point of environmental conservation.

(1) Reforestation plan (327 program):
Reforestation plan in the District will be completed by the year 2000 according to the Decree 327 program. Forest have many functions such as water conservation, soil conservation and production of wood; forests have an important value for conservation of natural environment in the District. Therefore, the budget for this program is strongly recommended to be prepared.

(2) Countermeasures against small scale gully erosion:
Countermeasures against small-scale gully erosions should be taken in the District before the erosions develop. Small gullies of 0.5 - 1.5 m width are possible to be stabilized by works carried out by local residents. Also, protection works can be carried out using easy-to-implement methods such as stone masonry work, fence weir and vegetation works.

(3) Countermeasures against excavation of soil material:
As the Project needs a great deal of soil material, the excavation of soil material should be paid attention. Borrow pit sites are located at the foot of the mountains and soil erosion may be originated from these sites. Thus, suitable excavation method, regulations related to excavation and the implementation of monitoring activities are needed.

(4) Countermeasures against involuntary resettlement:
The inhabitants of 8 houses may be obliged to move out of their houses due to the establishment of new pumping station. This problem should be solved with land guarantee and other proper living assistance for those who are affected. Also, monitoring of project impacts should be implemented on natural and social environments in a host area.

(5) Countermeasures for erosion in the Lam River
River erosion occurs in the right bank of Lam river in Khanh Son commune. Lam river is a big river with a catchment area of 27,200 km2 and the upstream of river reaches Laos. Annual mean discharge in the estuary is estimated at 500 m3/s. Therefore, the countermeasure of river erosion should be solved in the Province level or National level.

APPENDIX L : TABLES

Table L.2.1 Appraisal Decentralization of EIA

No	Operating Projects and Enterprises	MOSTE	DOSTE
1	Mining	Big and medium mine	Small
2	Chemical plant	All	
3	Steel plant	All	
4	Non-ferrous metal plant	All	
5	Leather plant	Over 1,000 ton / year	> 1,000 ton / year
6	Textile plant	Over 30 mil m / year	> 30 mil m / year
7	Pesticide plant	All	
8	Rubber and paint plant	All	
9	Plastic plant	Over 1,000 ton / year	> 1,000 ton / year
10	Radiation plant	All	
11	Airport	All	
12	Export processing zone	All	
13	Hydropower dam water reservoir	Over 100 mil m3 / year	> 100 mil m3 / year
14	Irrigation system	As above	As above
15	Thermal and other kinds of power plants	Over 30 MW	> 30 MW
16	Cement plant	Over 500,000 ton / year	> 500,000 ton / year
17	Paper and paper pulp mill	Over 40,000 ton / year	> 40,000 ton / year
18	Pharmaceutical plant	Central	Province
19	Fertilizer plant	Over 100,000 ton / year	> 100,000 ton / year
20	Food processing factory	Over 1,000 ton / year	> 1,000 ton / year
21	Sugar plant	Over 100,000 ton / year	> 100,000 ton / year
22	Hospital	Over 500 beds	> 500 beds
23	Railway, Motorway of grades 1,2,3	Over 50 km	> 50 km
24	Power transmission station	Over 110 kV	> 110 kV
25	Tourism and entertainment resort	Over 100 ha	> 100 ha
26	Oil and gasoline store	Over 3,000 m3	> 3,000 m3
27	Poisonous chemicals store	All	
28	Plantation	Over 2,000 ha	> 2,000 ha
29	Wood exploiting farm	Over 3,000 ha	> 3,000 ha
30	Industrial forestation farm	Over 2,000 ha	> 2,000 ha
31	Aquacultural farm	Over 200 ha	> 200 ha
32	Port	Over 100,000 ton	> 100,000 ton
33	Ply-wood factory	Over 500,000 m2 / year	> 500,000 m2 / year
34	Migration area	Over 500 households	> 500 households
35	Alluvial plane	Over 500 ha	> 500 ha
36	Engineering factory	Over 50,000 ton / year	> 50,000 ton / year
37	Telecommunication stations	Central	Province
38	Freezing plant	Large and medium scale	Small
39	Construction material factory	Large and medium scale	Small
40	Hotel and business sector	Large and medium scale	Small

Source: Document of Setting up a Report on EIA, Hanoi 1995
MOSTE means Ministry of Science, Technology and Environment
DOSTE means Department of Science, Technology and Environment

Table L.2.2 Implementation of the 327 Program in Vietnam (1993 to 1996)

Description	Unit	Implementation	Remark
I. Forestry			
(1) Protection of forest	1,000 ha	1,606.01	
(2) Regeneration	1,000 ha	139.23	
(3) Reforestation	1,000 ha	397.27	
(4) Maintenance	1,000 ha	913.44	
II. Agriculture			
(1) Rubber	ha	21,740.4	
(2) Coffee	ha	5,780.5	
(3) Tea	ha	10,660.5	
(4) Fruit	ha	18,214.7	
(5) Industry trees	ha	25,210.5	
(6) Garden	ha	39,226.9	
(7) Livestocks	num.	58,943	
III. Resettlement and Migration			
(1) Total	person	60,319	
(2) Resettlement	household	198,193	
(3) Migration	household	88,689	
- Migration	household	25,132	
- Other	household	63,557	Migration to near place
IV. Construction			
(1) Land reclamation	ha	27,018.9	
(2) Village road	km	4,356.5	
(3) School house	m2	82,933.0	
(4) Hospital	m2	16,434.6	
(5) Irrigation	ha	10,245.4	
(6) Water supply	person	21,496	
(7) Others	sector	72	
V. Total of Capital		1,835,358.59	
(1) Forestry	Million VND	926,096.75	
(2) Agriculture	Million VND	359,284.50	
(3) Construction	Million VND	373,322.82	
(4) Resettlement	Million VND	85,213.86	
(5) Management Cost	Million VND	91,440.66	

Source: Ministry of Planning and Investment

Table L.4.1 The List of Fauna in Nghe An Province

No.	Fauna	Order	Family	Name	Status
1	Mammals	Dermoptera	Hipposideridae	Paracoelops megalotis	Rare
2	"	Primates	Cercopithecidae	Maccaca arctoides	Vulnerable
3	"	"	"	Macaca assamensis	Vulnerable
4	"	"	"	Macaca nemestrina	Vulnerable
5	"	"	"	Trachypithecus phayrei crepusculcus	Vulnerable
6	"	"	"	Trachypithecus francoisi delacouri	**Endangeded**
7	"	"	"	Pygathrix nemaeus nemaeus	**Endangeded**
8	"	"	Hylobatidae	Hylobates concolor leucogenis	**Endangeded**
9	"	"	Ursidae	Selenarctos thibetanus	**Endangeded**
10	"	"	Mustelidae	Lutra lutra	Threatened
11	"	"	Felidae	Felis temmincki	Vulnerable
12	"	"	"	Panthera pardus	**Endangeded**
13	"	"	"	Panthera tigris	**Endangeded**
14	"	Proboscidea	Elephantidae	Elephas maximus	Vulnerable
15	"	Artiodactyla	Tragulidae	Tragulus javanicus	Vulnerable
16	"	"	Cervidae	Cervus nippon	Vulnerable
17	"	"	Bovidae	Bos gaurus	**Endangeded**
18	"	"	"	Capricornis sumatraensis	Vulnerable
19	"	Pholidota	Manidae	Manis pentadactyla	Vulnerable
20	"	Rodentia	Petauristidae	Petaurista petaurista	Rare
21	Birds	Galliformes	Phasianidae	Lophura hatinhensis	**Endangeded**
22	"	Strigiformes	Strigidae	Ketupa zeylonensis orientalis	Threatened
23	"	Coraciiformes	Alcedinidae	Ceryle lugubris guttulata	Threatened
24	"	"	Bucerotidae	Ptiloaemus tickelli	Threatened
25	"	Piciformes	Picidae	Picus rabieri	Threatened
26	"	Passeriformes	Eurylaimidae	Carydon sumatranus khmerensis	Rare
27	Reptilia	Squamata	Geckonidae	Gecko gecko	Threatened
28	"	"	Agamidae	Acanthosaura lepidogaster	Threatened
29	"	"	"	Physignathus cocincinus	Vulnerable
30	"	"	Varanidae	Varanus salvator	Vulnerable
31	"	"	Boidae	Python molurus	Vulnerable
32	"	"	Colubridae	Ptyas korros	Threatened
33	"	"	"	Ptyas mucosus	Vulnerable
34	"	"	Elapidae	Bungarus fasciatus	Threatened
35	"	"	"	Naja naja	Threatened
36	"	"	"	Ophiophagus hannah	**Endangeded**
37	"	Testudinata	Testudinidae	Geochelone impressa	Vulnerable
38	"	Salientia	Bufonidae	Bufo galeatus	Rare
39	Fishes	Clupeiformes	Clupeidae	Hilsa reevesii	Vulnerable
40	"	"	"	Clupanodon thrissa	Vulnerable
41	"	"	"	Clupanodon punctatus	Vulnerable
42	"	Cypriniformes	Cyprinidae	Onychostoma laticeps	Vulnerable
43	"	"	"	Semilabeo notabilis	Vulnerable
44	"	"	"	Altigena lemassoni	Vulnerable
45	"	"	"	Labeo tonkinensis	Vulnerable
46	"	"	"	Spinibarbus caldwelli	Vulnerable
47	"	"	"	Spinibarbichthys denticulatus	Vulnerable
48	"	"	"	Tor brevifilis	Vulnerable
49	"	"	"	Mylopharyngodon piceus	Vulnerable
50	"	"	"	Megalobrama terminalis	Vulnerable
51	"	"	Bagridae	Hemibagrus elongatus	Vulnerable
52	"	"	"	Cranoglanis sinensis	Vulnerable
53	"	Ophiocephaliforme	Ophiocephalidae	Ophiocephalus striatus	Threatened
54	"	Perciformes	Eleotridae	Bostrichthys sinensis	Vulnerable
55	"	Actinodontida	Amblemidae	Lamprotula leai	Vulnerable
56	"	Homoptera	Lacciferidae	Kerria lacca	Vulnerable

Source: Red Data Book of Vietnam: Volume 1. Animals
Science and Technics Publishing House: Hanoi-1992

Table L.4.2 The List of Flora in Nghe An Province

No.	Flora	Order	Family	Name	Status
1	Cormobionta	Magnoliophyta	Magnoliopsida	Aquilaria crassna	Endangered
2	"	"	"	Ardisia silvestris	Vulnerable
3	"	"	"	Chukrasia tabularis	K(*)
4	"	"	"	Cinnadenia paniculata	K
5	"	"	"	Cinnamomum parthenoxylon	K
6	"	"	"	Enicosanthellum plagioneurum	Rare
7	"	"	"	Garcinia fagraeoides	Vulnerable
8	"	"	"	Hopea hainanesis	K
9	"	"	"	Madhuca pasquieri	K
10	"	"	"	Manglietia fordiana	Vulnerable
11	"	"	"	Melientha suavis	K
12	"	"	"	Parashorea chinensis	K
13	"	"	"	Pavieasia annamensis	Threatened
14	"	"	"	Platanus kerrii	Threatened
15	"	"	"	Rauvolfia verticillata	Vulnerable
16	"	"	"	Sindora tonkinensis	Vulnerable
17	"	"	"	Strophanthus divaricatus	Threatened
18	"	"	"	Tsoongiodendron odorum	Vulnerable
19	"	"	Liliopsida	Calamus poilanei	K
20	"	"	"	Guihaia grossefibrosa	Threatened
21	"	"	"	Smilax glabra	Vulnerable
22	"	"	Pinophyta	Cunninghamia konishii	Rare
23	"	"	"	Cycas balansae	Rare
24	"	"	"	Fokienia hodginsii	K
25	"	"	"	Nageia fleuryi	Vulnerable
26	"	"	"	Nageia wallichiana	Vulnerable
27	"	"	Polypodiophyta	Drynaria fortunei	Threatened
28	Thallobionta	Rhodophyta	-	Hypnea cornuta	K

Source: Red Data Book of Vietnam: Volume 2. Plants
Science and Technics Publishing House: Hanoi-1996

Remark: (*) "K" means insufficiently known

Table L.6.1 (1/2) Check List of IEE (I: Social Environment)

(1/2)

Category of Environment Impacts	Evaluation	Note	Marks	Remark
1. Socioeconomic Issues				
1) Social Aspects				
(1) Planned agricultural settlement	No	No settlement plan	C	
(2) Involuntary resettlement	Yes	Lands and houses have possibility that are expropriated partially by expansion of road width; resettlements of 8 residential houses are needed by establishment of new pumping station.	B	Land guarantee and monitoring
(3) Substantial changes in ways of life	No	No change of life style	C	
(4) Conflict among communities and peoples	No	Most of people consist of farmer and they can benefit by rural development project.	C	
(5) Impacts on indigenous peoples, ethnic minorities and nomads	No	There are not indigenous peoples, ethnic minorities and nomads in the district.	C	
2) Demographic Issues				
(6) Population increase	No	Rapid increase of population does not occur by the development project.	C	
(7) Drastic change in population composition	No	No drastic change in population composition	C	
3) Economic Activities				
(8) Relocation of basis of economic activities	No	The basis of economic activities is agriculture and the project does not change the basis.	C	
(9) Occupational change, loss of labor opportunity	No	Labor opportunities are accelerated through construction work of the project.	C	
(10) Increase in income disparities	No	Most of people can equally get the benefit of the project.	C	
4) Institutional and Custom related Issues				
(11) Adjustment and regulation of water or fishing rights	Yes	Rehabilitation and new construction of irrigation facilities are proposed. Therefore, adjustment of water right is needed to avoid negative impact between beneficiaries.	B	Proper adjustment and countermeasure are needed.
(12) Changes in social and institutional structures	Yes	Reinforcement of farmer's organization need the change in social and institutional structures.	B	Requirement of new
(13) Changes in existing institutions and customs	No	No change	C	
2. Health and Sanitary Issues				
(14) Increased use of agrochemicals	No	According to farming program, increase use of agrochemicals is not planned.	C	
(15) Outbreak of endemic diseases	Yes	4 schistosomiasis patients are recorded.	B	Countermeasure and monitoring
(16) Prevalence of epidemic diseases	Yes	174 malaria patients are recorded.	B	Countermeasure and monitoring
(17) Residual toxicity of agrochemicals	No	According to farming program, increase use of agrochemicals is not planned.	C	
(18) Increase in domestic and other human wastes	No	Domestic and other human wastes does not increase without drastic increase of population.	C	
3. Cultural Issues				
(19) Impairment of historic remains and cultural assets	No	The development project is not planned in cultural assets.	C	
(20) Damage to aesthetic sites	No	Inharmonious and enormous structures that damage to aesthetic sites are not planned.	C	
(21) Impediment of mineral resources exploitation	No	There are no valuable mineral resources.	C	

Mark classification; A: Impact is deemed strong, B: Some impact, C: Impact is very small

Table L.6.1 (1/2) Check List of IEE (I: Social Environment)

(1/2)

Category of Environment Impacts	Evaluation	Note	Marks	Remark
1. Socioeconomic Issues				
1) Social Aspects				
(1) Planned agricultural settlement	No	No settlement plan	C	
(2) Involuntary resettlement	**Yes**	Lands and houses have possibility that are expropriated partially by expansion of road width; resettlements of 8 residential houses are needed by establishment of new pumping station.	B	Land guarantee and monitoring
(3) Substantial changes in ways of life	No	No change of life style	C	
(4) Conflict among communities and peoples	No	Most of people consist of farmer and they can benefit by rural development project.	C	
(5) Impacts on indigenous peoples, ethnic minorities and nomads	No	There are not indigenous peoples, ethnic minorities and nomads in the district.	C	
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(7) Drastic change in population composition	No	No drastic change in population composition	C	
3) Economic Activities				
(8) Relocation of basis of economic activities	No	The basis of economic activities is agriculture and the project does not change the basis.	C	
(9) Occupational change, loss of labor opportunity	No	Labor opportunities are accelerated through construction work of the project.	C	
(10) Increase in income disparities	No	Most of people can equally get the benefit of the project.	C	
4) Institutional and Custom related Issues				
(11) Adjustment and regulation of water or fishing rights	**Yes**	Rehabilitation and new construction of irrigation facilities are proposed. Therefore, adjustment of water right is needed to avoid negative impact between beneficiaries.	B	Proper adjustment and countermeasure are needed.
(12) Changes in social and institutional structures	**Yes**	Reinforcement of farmer's organization need the change in social and institutional structures.	B	Requirement of new
(13) Changes in existing institutions and customs	No	No change	C	
2. Health and Sanitary Issues				
(14) Increased use of agrochemicals	No	According to farming program, increase use of agrochemicals is not planned.	C	
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(16) Prevalence of epidemic diseases	**Yes**	174 malaria patients are recorded.	B	Countermeasure and monitoring
(17) Residual toxicity of agrochemicals	No	According to farming program, increase use of agrochemicals is not planned.	C	
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(20) Damage to aesthetic sites	No	Inharmonious and enormous structures that damage to aesthetic sites are not planned.	C	
(21) Impediment of mineral resources exploitation	No	There are no valuable mineral resources.	C	

Mark classification: A: Impact is deemed strong, B: Some impact, C: Impact is very small

Table L.6.1 (2/2) Check List of IEE (II: Natural Environment)

Category of Environment Impacts	Evaluation	Note	Marks	Remark
4. Biological and Ecological Issues				
(22) Deterioration or degradation of vegetation	No	Land reclamation in the forest area is not proposed.	C	
(23) Negative impact on important or indigenous fauna and flora	No	The project area consists of cultivated land and artificial forests.	C	
(24) Degradation of ecosystem with biological diversity	No	Valuable species are seldom found in the project area.	C	
(25) Proliferation of exotic and/or hazardous species	No	According to farming program, exotic crop and alteration of vegetation does not be proposed.	C	
(26) Encroachment on wetland and peat swamp	No	There are not wetland and peat swamp.	C	
(27) Encroachment on tropical forests	No	Tropical forests are seldom found.	C	
(28) Destruction or degradation of mangrove forests	No	Mangrove forest near the estuary of Lam river does not be affected directly by the project.	C	
(29) Degradation of coral reef	No	No coral reefs near the estuary of Lam river inhabit.	C	
5. Soil and Land Resources				
1) Soil Resources				
(30) Soil erosion	Yes	Soil erosion should be paid attention because a large quantity of soil is needed for road plan, reservoir plan and flood protection plan.	B	Regulation for excavation and monitoring
(31) Soil salinization	No	The project does not accelerate soil salinization.	C	
(32) Deterioration of soil fertility	No	It can be avoided by adequate soil management and suitable cropping pattern.	C	
(33) Soil contamination by agrochemical	No	According to farming program, use of agrochemical and fertilizer is existing level.	C	
2) Land Resources				
(34) Devastation or desertification of land	No	The district consists of paddy field and forest area that managed well.	C	
(35) Devastation of hinterland	No	Land reclamation in hinterland does not be proposed.	C	
(36) Ground subsidence	No	Intake from groundwater is limited to domestic water.	C	
6. Hydrology and Air and Water Quality Issues				
1) Hydrology				
(37) Changes in surface water hydrology	No	Increase of intake from Lam river and reservoir is 2 to 3 m3/s.	C	
(38) Changes in groundwater hydrology	No	Intake from groundwater is limited to domestic water.	C	
(39) Inundation and flood	No	Rather, flood and inundation decrease by improvement of drainage system.	C	
(40) Soil sedimentation	Yes	Soil sedimentation may occur in reservoirs, canals and pumping station, if no countermeasure.	B	Watershed conservation
(41) Riverbed degradation	No	The construction plan such as head work is not proposed in Lam river.	C	
(42) Impediment of inland navigation	No	There are no facilities plan that affect inland navigation.	C	
2) Water quality and temperature				
(43) Water contamination and deterioration of water	No	According to farming program, increase use of agrochemicals is not planned.	C	
(44) Water eutrophication	No	According to farming program, increase use of fertilizer is not planned.	C	
(45) Sea water intrusion	No	Increase of intake from Lam river and reservoir is 2 to 3 m3/s.	C	
(46) Low irrigation water temperature	No	Existing water temperature is over 20 degree (Nov, 1996).	C	
3) Atmosphere				
(47) Atmosphere pollution	No	No source	C	

Mark classification; A: Impact is deemed strong, B: Some impact, C: Impact is very small

Table L.6.1 (2/2) Check List of IEE (II: Natural Environment)

(2/2)

Category of Environmental Impacts	Evaluation	Note	Marks	Remark
4. Biological and Ecological Issues				
(22) Deterioration or degradation of vegetation	No	Land reclamation in the forest area is not proposed.	C	
(23) Negative impact on important or indigenous fauna and flora	No	The project area consists of cultivated land and artificial forests.	C	
(24) Degradation of ecosystem with biological diversity	No	Valuable species are seldom found in the project area.	C	
(25) Proliferation of exotic and or hazardous species	No	According to farming program, exotic crop and alteration of vegetation does not be proposed.	C	
(26) Encroachment on wetland and peat swamp	No	There are not wetland and peat swamp.	C	
(27) Encroachment on tropical forests	No	Tropical forests are seldom found.	C	
(28) Destruction or degradation of mangrove forests	No	Mangrove forest near the estuary of Lam river does not be affected directly by the project.	C	
(29) Degradation of coral reef	No	No coral reefs near the estuary of Lam river inhabit.	C	
5. Soil and Land Resources				
1) Soil Resources				
(30) Soil erosion	**Yes**	Soil erosion should be paid attention because a large quantity of soil is needed for road plan, reservoir plan and flood protection plan.	B	Regulation for excavation and monitoring
(31) Soil salinization	No	The project does not accelerate soil salinization.	C	
(32) Deterioration of soil fertility	No	It can be avoided by adequate soil management and suitable cropping pattern.	C	
(33) Soil contamination by agrochemical	No	According to farming program, use of agrochemical and fertilizer is existing level.	C	
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(34) Devastation or desertification of land	No	The district consists of paddy field and forest area that managed well.	C	
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(37) Changes in surface water hydrology	No	Increase of intake from Lam river and reservoir is 2 to 3 m3/s.	C	
(38) Changes in groundwater hydrology	No	Intake from groundwater is limited to domestic water.	C	
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(46) Low irrigation water temperature	No	Existing water temperature is over 20 degree (Nov, 1996).	C	
3) Atmosphere				
(47) Atmosphere pollution	No	No source	C	

Mark classification; A: Impact is deemed strong, B: Some impact, C: Impact is very small

APPENDIX L : FIGURES

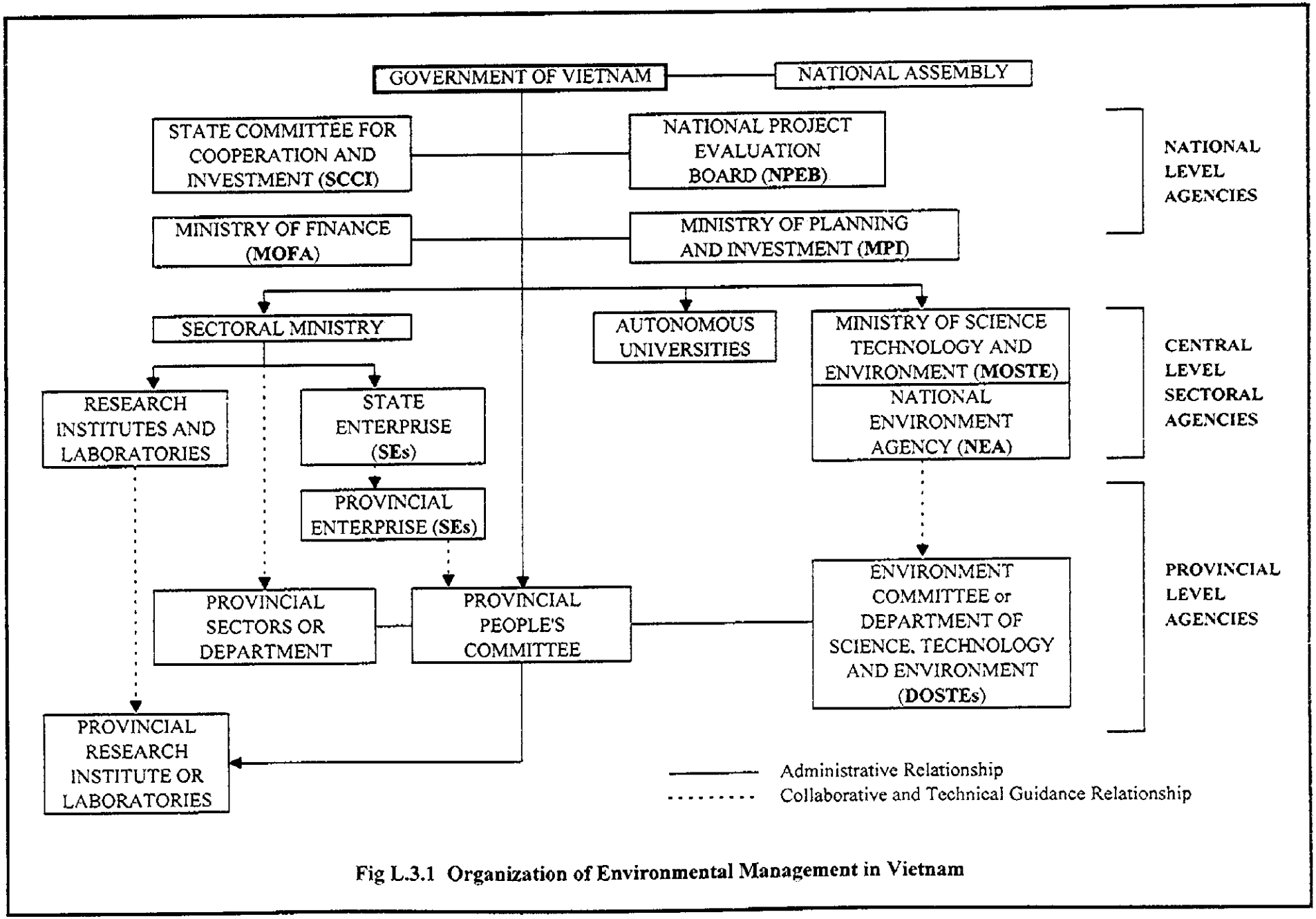
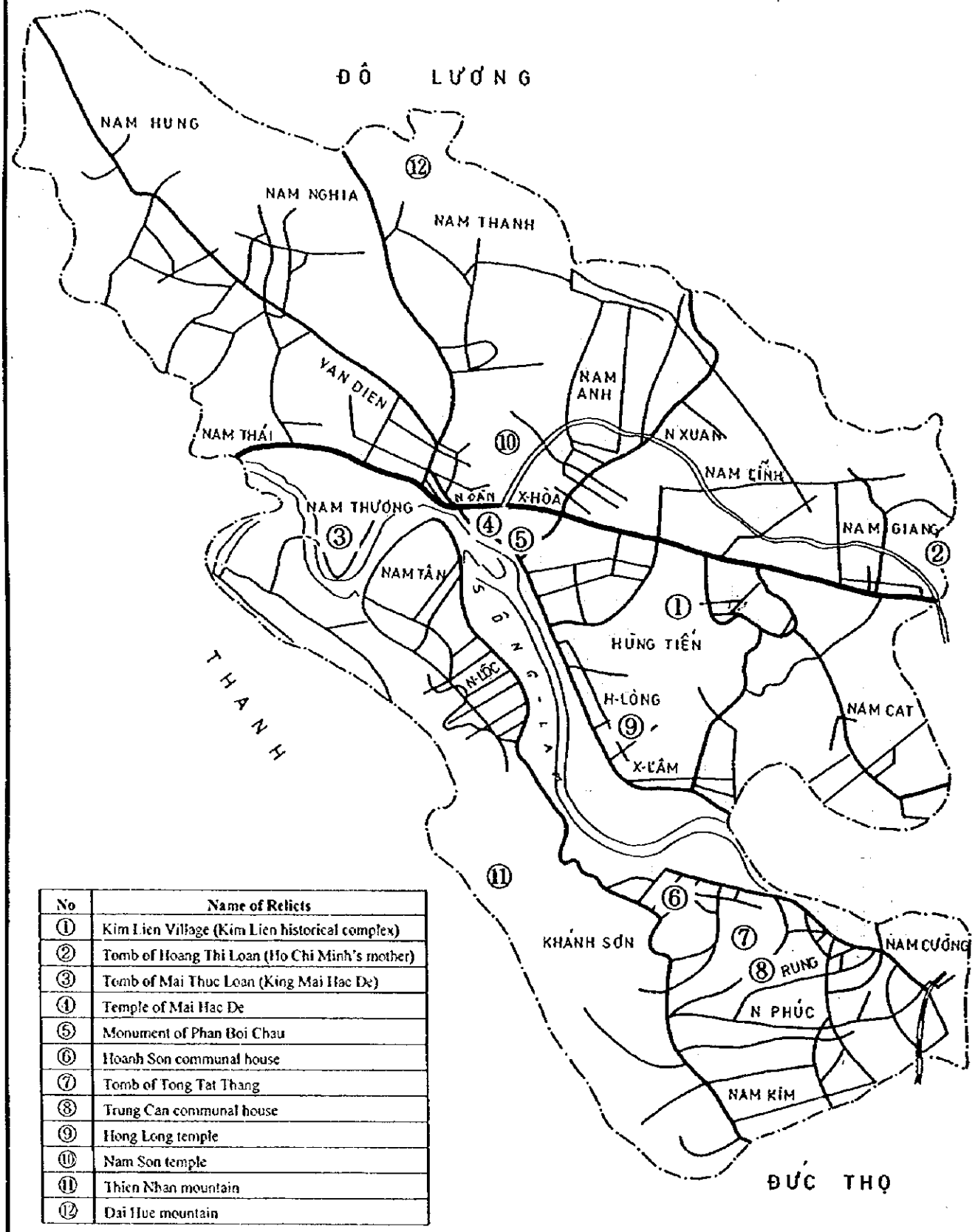
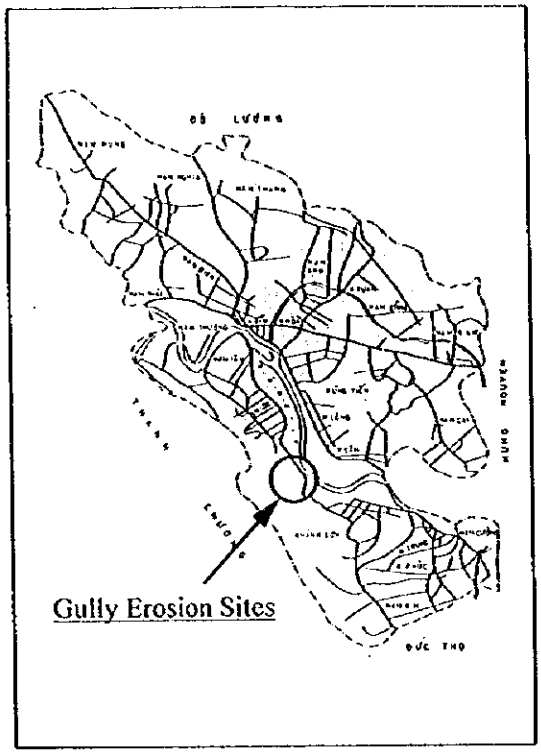


Fig L.3.1 Organization of Environmental Management in Vietnam



No	Name of Relicts
①	Kim Lien Village (Kim Lien historical complex)
②	Tomb of Hoang Thi Loan (Ho Chi Minh's mother)
③	Tomb of Mai Thuc Loan (King Mai Hac De)
④	Temple of Mai Hac De
⑤	Monument of Phan Boi Chau
⑥	Hoanh Son communal house
⑦	Tomb of Tong Tat Thang
⑧	Trung Can communal house
⑨	Hong Long temple
⑩	Nam Son temple
⑪	Thien Nhan mountain
⑫	Dai Hue mountain

Fig L.4.1 Location of Relicts in the Nam Dan District



S = 1/10,000

No.3 Erosion Site

No.2 Erosion Site

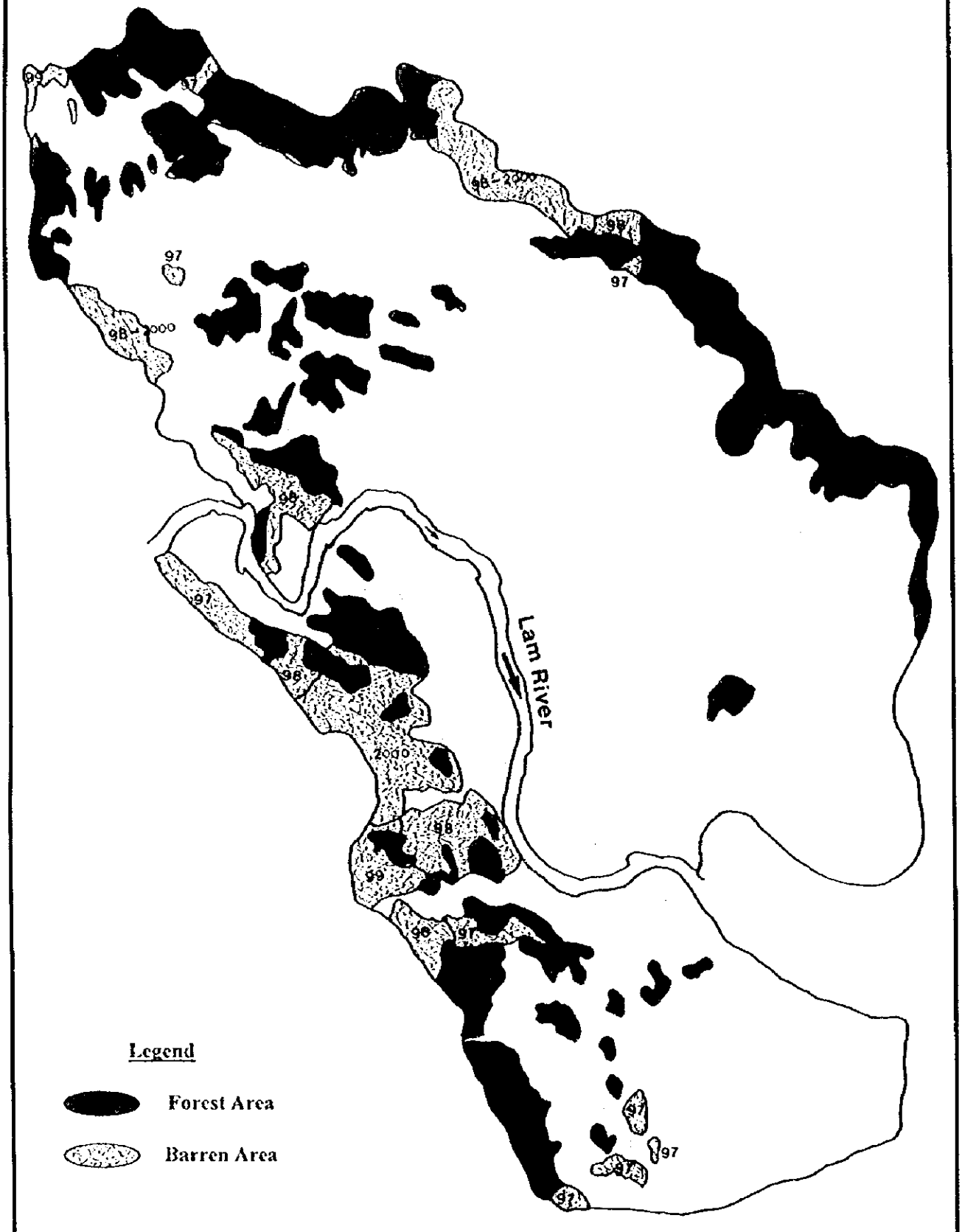
No.1 Erosion Site

Lam River

Transmission line 500KV

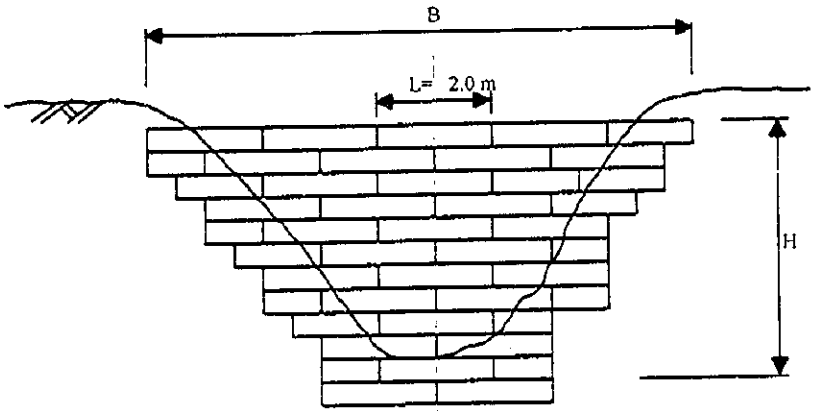
S Ô N

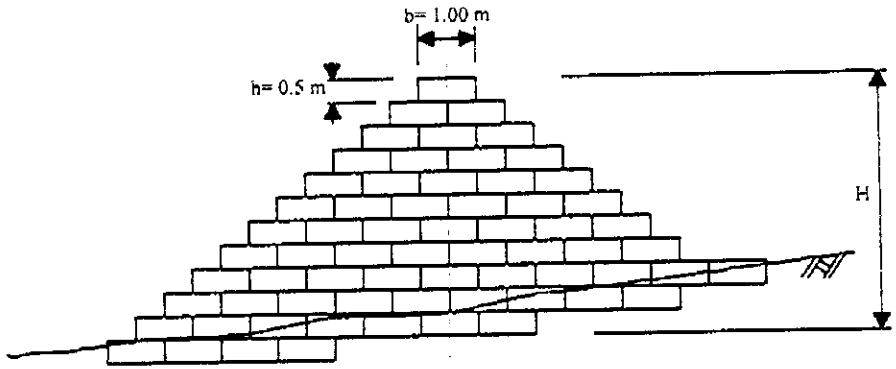
Fig L.5.1 Location of Gully Erosion in the Nam Dan District



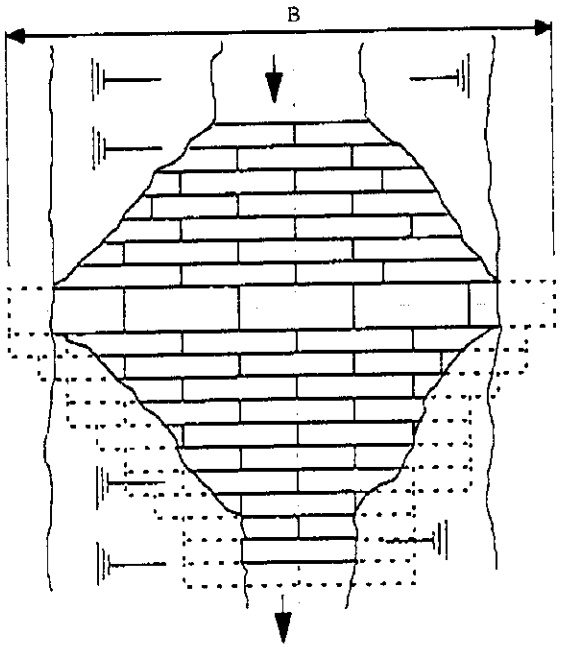
Remark: Number shows reforestation plan of each year
Source: Dai Hue-Nam Dan Afforestation Yards

Fig L.5.2 Reforestation Plan in the Nam Dan District





Remarks: Standards measures of gabion consist of L= 2.0m, h= 0.5m and b= 1.0m.



The Summary of Gabion Works

Site	Weir Num.	Location of Weir	Gabion Works			
			H (m)	B (m)	V (m3)	Excavation (m3)
No.1 Erosion	No.1	10 m upstream from No.15A road	6.0	12.0	514.8	216.0
	No.2	10 m upstream from No.1 weir	5.0	10.0	322.7	156.0
No.2 Erosion	No.1	5 m upstream from No.15A road	4.0	7.0	198.0	105.6
	No.2	10 m upstream from No.1 weir	4.0	7.0	198.0	105.6
	No.3	5 m upstream from No.2 weir	3.0	7.0	115.5	64.8
	No.4	10 m upstream from No.3 weir (left)	5.0	9.0	342.7	156.0
	No.5	10 m upstream from No.3 weir (right)	5.0	8.0	322.7	156.0
No.3 Erosion	No.1	10 m upstream from No.15A road	5.0	7.0	262.2	156.0
	No.2	30 m upstream from No.1 weir	10.0	27.0	2,849.0	552.0
Total					5,125.6	1,668.0

Fig L.7.1 Standard Drawing of Gully Protection Works

APPENDIX M : RURAL SOCITY AND FARM HOUSEHOLD ECONOMY

THE STUDY
ON
MODEL RURAL DEVELOPMENT
IN
NAM DAN DISTRICT, NGHE AN PROVINCE

FINAL REPORT

APPENDIX-M : RURAL SOCIETY AND FARM HOUSEHOLD ECONOMY

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LIST OF ATTACHMENT

LIST OF FIGURES

APPENDIX-M : RURAL SOCIETY AND FARM HOUSEHOLD ECONOMY

M.1 Introduction

The Socio-Economic Survey on farm households was conducted in this Study from October 29 to December 12, 1996. The objective of this Survey is to provide necessary information of socio-economic condition for formulating the Master Plan in this Study. The Survey was designed to obtain information utilized in this Study. The results of the analysis obtain support to each program to be formulated in the Master Plan. The procedure of the Survey is summarized in the following section.

M.2 Implementation of the Survey

M.2.1 Selection of Surveyor

In this survey, eight (8) personnel with the following disciplines were selected as the surveyors from the Central, the Provincial and the District level, in order to cover wide range of categories regarding socio-economic conditions:

1. Socio-economy
2. Agronomy
3. Planning
4. Education
5. Health
6. Organization
7. Agricultural Extension
8. Women in Development (WID)

The occupation list of surveyors with their occupation is showed as follow:

Occupation List of Surveyors

Desipline	Occupation
Socio-economy (Leader)	Center for Rural Development, NIAPP, Ministry of Agriculture & Rural Develo
Agro-economist/Planning	Department for Planning & Investment, Peope's Committee, Nghe An Province
Agronomist	Agricultural Technology Department, Nghe An Province
WID (regal adviser)	Women's Union, Marriage & Family Department, Nghe An Province
Extension	Agricultural Extension Station, Nam Dan District
Organization	Farmers' Association, Namdan District

M.2.2 Preparation of Questionnaire

Prior to the survey, the questionnaire are prepared as the result of discussion between the Vietnamese counterparts including the surveyors and the Study team. The questionnaire are consist of the following three (3) forms:

1. Form A : Socio-Economic Survey on Farm Household
2. Form B : Intention Survey of Farm Management in Village
3. Form C : General Data on Socio-Economic Situation of Commune

The questionnaire are designed to cover the following categories regarding socio-economic conditions of farm household:

1. Family	2. Living condition	3. Eating
4. Health and Sanitation	5. Education	6. Cultivating Land Area
7. Cultivation, Yield and Marketing		8. Infrastructure
9. Agricultural Equipment & Tools		10. Agricultural Facility
11. Labor	12. Income	13. Expenditure

The form of questionnaire are shown in TABLE M.2.1(Form A), M.2.2(Form B) and M.2.3(Form C).

M.2.3 Execution of the Survey

At the beginning of the survey, basic data of socio-economic condition including population, cultivating area, average income and infrastructures was collected at each commune. At the same time, the purpose of this survey and necessity of their cooperation were explained to officials in the commune. The collected communal data are displayed in TABLE M.2.4 attached herewith.

After completing the communal data collection, preliminary survey in several communes was conducted as training session for the surveyors. Then, the survey utilizing the questionnaire was conducted covering all twenty-four (24) communes including one (1) town in the study area. For each commune, villages were stratified into a few groups, then, the total of four (4) villages are selected from each group for the survey. The selected villages were identified as shaded line in the table in TABLE M.2.4.

For the selected village, farmers were also stratified into a few groups and the total of five (5) farmers were selected to be interviewed. Villages and farmers were carefully selected to cover all range of stratified groups in order to obtain representative data of socio-economic condition in the area.

According to the procedure mentioned above, the total of four hundred eighty (480) samples were collected through the survey as follow:

5 farmers/villages x 4 villages/commune x 24 communes in the study area
= TOTAL 480 farmers (samples)

M.3 Result of the Survey

In order to clarify the conditions of rural society and farm household economy, the Socio-Economic Survey covering the whole area in Nam Dan District was conducted by adopting the method of Rapid Rural Appraisal. The results of the survey and the information collected through the survey are summarized as follow:

M.3.1 Grouping of Communes in Study Area

For the purpose of displaying clearly the conditions of the Study Area, the communes located in the area are arranged into 6 groups as described below, basing upon the data for each commune regarding average income of farm household, food sufficiency and etc.

Since the Study Area is divided by the Lam River, 24 communes located in the Study Area are firstly divided into 2 groups separated by the river. There are 8 communes located in the area at the right side of the river. Among these communes, 5 communes denominated "Nam Nam Region" and located at the south edge of the area are grouped together as "Nam Nam Area" due to the similar characteristics of the communes such as relatively low income level, agricultural activities and far distance from the Nam Dan ferry. Other communes in the area located closer to the ferry are grouped together as "Right Plain Area" due to their similarity of topographical conditions as plain field and their similarity of the survey results.

On the other hand, 16 communes are located at the left side of the Lam River including Nam Dan Town, activities of which are mainly commercial. In comparison with other communes, the town is drastically transforming itself into a metropolis to play the role of a central town in the district. Based on these conditions, Nam Dan Town alone is considered as one area group and is denominated as "Nam Dan Town". Four communes located in the northwest area on the left side of the river are grouped together as "Northwest Area" due to the similar characteristics of the communes such as the high poverty rate, low agricultural productivity and low food sufficiency rate as confirmed by the results of the survey.

In the northeast area on the left side of the river, there are mountainous ranges ranging from 400m to 500m. Four communes located in this area, which are characterized by their unique agriculture practice utilizing slopes of the mountains and relatively high farmers' income, are grouped together as "Mountainous Area". Seven communes in the area on the left side of the river are grouped together as "Plain Area" due to the characteristics of the relatively similar conditions such as agricultural activities of rice cultivation in the plain area, average income level and food sufficiency rate.

The grouping of the communes in the Study Area which are mentioned above is listed in the next table and the location of each area is shown in Fig. M.3.1.

Grouping of Communes of Nam Dan District

Area	Commune	Population	Total Area(km2)	Cultivated Area(km2)
Northwest Mountainous	Nam Hung, Nam Ghia Nam Thai, Nam Thanh	18,906(12%)	67.97(23%)	27.79(18%)
	Nam An, Nam Xuan Nam Linh, Nam Giang	25,004(16%)	51.07(17%)	31.66(21%)
Plain	Van Dien, Xuan Hoa Hung Tien, Kim Lien Hong Long, Xuan Lam Nam Cat	57,033(36%)	67.31(23%)	46.09(30%)
Nam Dan	Nam Dan	6,398(4%)	1.74(1%)	1.00(1%)
Right Plain	Nam Thuong, Nam Tan Nam Loc,	12,332(8%)	28.30(10%)	13.20(9%)
Nam Nam	Khanh Son, Nam Trung Nam Phuc, Nam Cuong Nam Kim	38,284(24%)	77.92(26%)	33.25(15%)
(Total)		157,957(100%)	294.31(100%)	153.03(100%)

The conditions of the rural society and farm household economy for each area of communal grouping are summarized in the following sections:

M.3.2 Social Aspects

(1) General Condition

People

The ancestors of the Vietnamese people are believed to be the race which inhabited the lower reaches of the Red River and formed the highly developed Bronze Age. They were under the control of China for more than 1,000 years between 2 B.C. and 10 B.C. Even after gaining their independence, Vietnamese were still influenced by China due to their historical and geographical relationship with the country. It is believed that the people who actively accepted Chinese culture became the Kin race which is the major race in Viet Nam; the people who were not influenced by the Chinese culture became the Muong race which is one of the minority races.

There are 54 races co-existing in Viet Nam; the Kin race being the majority while the other 53 races minorities. Among the minorities, the related races of Khmer and Thai from neighboring countries are most common; other minorities include the people from Polynesia or China Tibet. Most of the minorities generally inhabit in the mountains or highlands. The Study Area of Nam Dan is located in an area largely inhabited by the Kin race and any other minorities are not easily found. In the District, no minorities inhabit the mountains and problems such as friction between races and territorial dispute do not exist.

Religion

The popular religion of the people in Nam Dan District is Buddhism and the farmers believing in Buddhism enshrine their ancestors in Buddhist altars at their homes. Some farmers have a small pagoda in their front yards where they pray for the safety of their

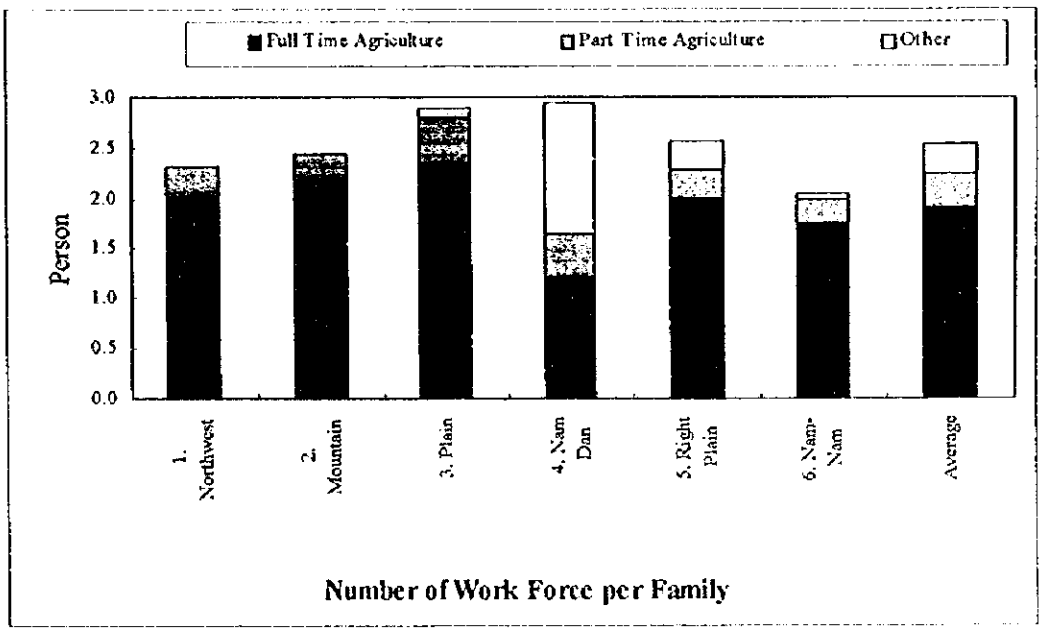
family, successful harvest of agricultural produce, etc. according to the lunar calendar. However, there are not many temples found in the villages and the custom of visiting temples is not popular. In Nam Dan Town, there is a temple where the body of a past regional king is enshrined and a permanent caretaker is living there.

Beside Buddhism, Christian people are living in communes including Nam Linh, Van Dien, Hong Long and Nam Loc. In these communes, there are churches which the followers living near by belong to. Among these communes, there are large-scale churches in Van Dien and Nam Loc communes and religious activities are lively. The relationship of people with different religions are fine and any religion-related troubles are not observed.

(2) Family

Average number of family members is 5.3 persons ranging from the lowest of 5.0 persons for Mountainous Area to the highest of 5.5 persons for Plain Area. The ratio of male and female for the family members is approximately 50:50.

The results show that an average of 1.9 persons in farm household is working full time in agriculture and only 0.3 person is working part time in agricultural activities and other occupations. Average of persons working in other than agriculture is 1.3 persons in Nam Dan Town and this is remarkably high compared with other communes especially Northwest Area and Mountainous Area where almost no persons are working in other than agriculture.



(3) Living Conditions

The average electrification ratio is 95% and the figures range from the lowest of 90% for Nam Nam Area to the highest of 100% for Nam Dan Town. According to the results of the survey, the water source for daily life is mainly well for 87% of families in the District. Notably, 20% of families in Nam Dan Town are utilizing river water for

their living. Equipment used for collecting water is mainly a well bucket and only a few families are using hand pumps. On the other hand, a few families in the communes except Northwest Area and Right Plain Area are using power pumps at their homes. The property of water source is mainly private (85%). However, the water source for 33% of families in Nam Nam Area is classified as of common use with other families.

The quantity of water is "enough" for 66% of the families in the area as an average. The highest figure of 84% is recorded for Plain Area and the lowest figure of 42% for Northwest Area. An average of 64% of the families consider that the water they use is of good quality. The figures of this category for each area correspond to the figures for water amount. However, only 55% of the families in the Plain Area which shows the highest figure for water amount (84%) consider that the water is of good quality.

For cooking purposes, an average of 85% of the families use wood/charcoal which are the major fuel materials available in the area. Additionally, husk and straw which are by-products of paddy are commonly used as fuel. The survey results show that a few people in Mountainous Area (3%) and Plain Area (2%) use electricity for cooking. Most of the electricity for cooking is utilized to operate small electric fans in order to supply extra oxygen for burning fuel to obtain more heat. The power source for lighting is mainly electricity for 92% of the families in the area and 37% of the families use kerosene for lighting.

Regarding type of house, an average of 14% of the families live in permanent type houses and 62% live in semi-permanent-type houses. A high percentage of the families live in permanent type houses in Mountainous Area (24%) and Nam Dan Town (30%). On the other hand, a high-percentage of the families live in temporary-type houses in Nam Nam Area (28%) and Right Plain Area (30%).

Among the goods listed in the questionnaire, 'bicycle' is the item which has the highest percentage of possession (86%), followed by 'wind fan' (66%) and 'clock' (57%). For other goods, 'television' has a response percentage of 47% and 'radio & cassette' has 46%. On the other hand, 'refrigerator' has only 1% in average. Regarding the source of information, the results show that the people receive information mainly from 'radio'(53%) and 'television' (45%). Also, the results show that 'Extension Worker' (42%) and 'Farmers' Union' (41%) are important sources of information for the people in the area.

Regarding the food sufficiency, approximately 30% of the people in Northwest, Right Plain and Nam Nam Areas answer that they are sometimes short of rice. Approximately 10% of the people in Mountainous, Nam Dan and Nam Nam Areas answer that they are always short of rice. For the people facing rice insufficiency, the major counter measure is to borrow some rice from relatives or neighbors. Only 3% of the people in the area are under some subsidiary program in order to solve their problems of food insufficiency. 'Rice'(99%) and 'vegetable' (98%) are the two major daily food items for the people, followed by 'soybean' (17%). The people occasionally consume some other food items such as 'meat' (66%) and 'fish' (64%).

The toilet in farm house is of type of "hole with ceramic stool" (50%) and "hole in the ground" (26%). The typical toilet observed in the area consists of a stool made of

ceramic or concrete located in a hut or at the corner of a hut for animals. Stools are simply designed to catch excreta. 17% of the people do not have any type of toilet. The percentage of the people whose family member getting sick last year is 52% and average medical expenditure is VND556,489 which is equal to 7% of the average annual income. 90% of the child birth take place at a Communal Health Center and only 5% of cases take place at home.

(4) Gender Conditions

In general, women's status in rural society is relatively high. in Viet Nam, the space for women's social activities is enlarged due to the fact that historically women took care of their family after men went to the war. Like the similar situation found in Japan, the concept of male chauvinism exists in Viet Nam as a result of the influence of Confucianism. On the other hand, it is generally considered that women control the accounts and activities in their family and also they handle most of heavy works. The proportion of the work which is under women's responsibility is larger than that of men because women are responsible for much work including household work, farming and animal husbandry. On important financial matters, men usually take responsibility for making a final decision.

The proportion of women being a head of household (or holding land use right) is 27% and the proportion of women who have utilized any financial support system in the past is only 17%. In farming operations, men are generally responsible for making decision, on the other hand, women take responsibility for selecting kind of animals to raise in many cases (73%). Also, women take responsibility of decision making on caring their children and elders, and on education for their children (56%). In 60% of the surveyed households, women make decision on selling their produce.

Among those developing countries, Viet Nam is characterized with relatively less gender inequality. Especially, there is almost no gender inequality on educational opportunities of primary and secondary school, literacy and medical opportunities. The most advanced condition is that importance of education for women is generally recognized in the society. However, gender inequality is observed mainly on daily household works of women. Comparing time schedule of men and women in a typical farm household, men spend much more time for resting or for leisure than women and women spend more time for child education and household work without much leisure time. In the case that women have established position in a family of making decisions or of financial independence, leisure time for the women is severely limited. However, under the condition that the regional differences of poverty is larger than the differences of gender inequality, the priority should be given to solving the poverty problems in the region.

M.3.3 Economic Aspects

(1) Agriculture

The average area of paddy field is 2,511m2 varying from 1,559m2 (Nam Dan) to 3,509m2 (Plain). The average number of plots is 6.7. Orchard and/or other perennial crop fields are found mainly in Northwest Area (2,258m2) and Mountainous Area

(2,285m2). The results show that 58% of the farmers in the area have an access road to all or some of their cropping fields. At the same time, 31% of the farmers do not have any access road to their fields. Regarding irrigation water, an average of 76% of the farmers answer that they have enough water during the dry and/or rainy season. The highest response percentage to the question 'lack of water' appears in Northwest Area (29%). The agricultural equipment commonly used by the farmers in the area are 'Cart, Cattle-Drawn Wagon' (69%), 'Manual Hand Sprayer' (52%) and 'Thresher' (49%). Use and possession of equipment tend to be more popular in Plain and Right Plain Areas.

Concerning agricultural facilities, an average of 82% of the farmers have a shed for livestock. However, separate-type feed storage facilities are not found in the area. Facilities are mainly used to shelter 'Egg-laying chicken' (69%), 'Cattle' (54%) and 'Goat and Sheep' (46%). Notably, a relatively high percentage of farmers use facilities for 'Egg-laying chicken' in Northwest (82%) and in Mountainous (78%) Areas. Also, facilities are used for 'Milk Cattle' in Right Plain (77%) Area. Use of waged labor for agricultural production is rare in the area and only 6% of farmers use such labor. Purposes of using such labor are 'Tilling', 'Weeding' and 'Transporting'. Main draft animals are cattle and buffalo. In Nam Dan District, 57% of farmer have cattle and 26% of them have buffalo. About 90% of these cattle and buffalo are used for drafting.

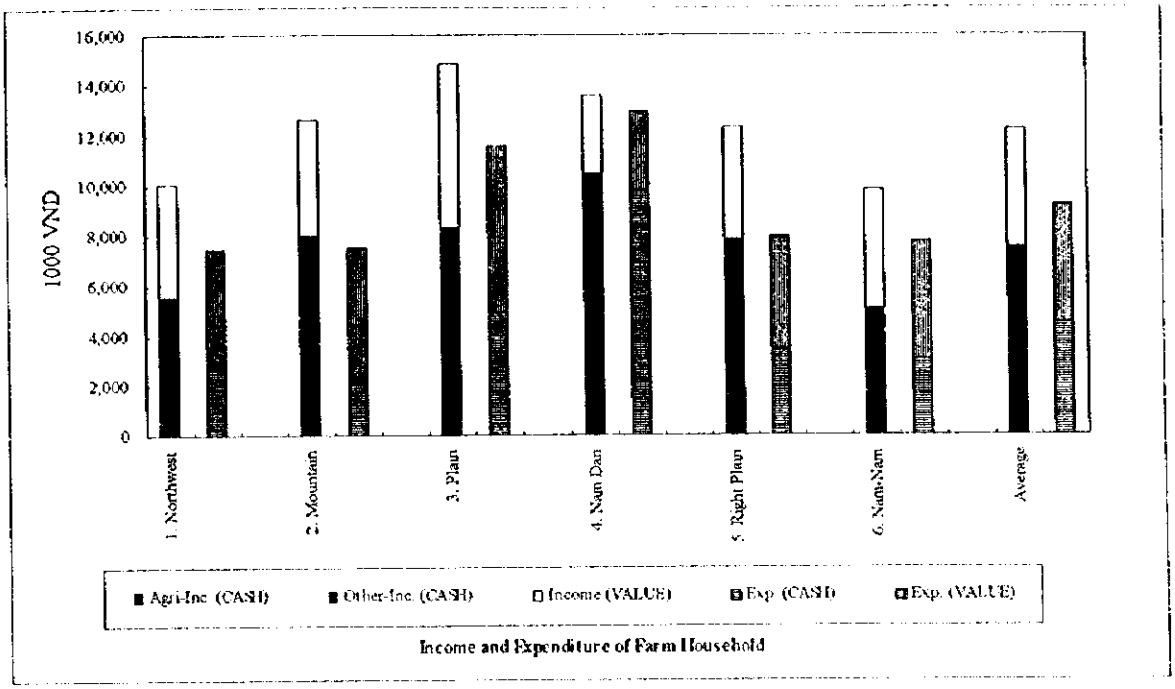
(2) Economic Conditions

The average of cash income per farm household is VND7.5 million. As a typical model of rural household management, each household consumes a part of its own production as self consumption. Including the self-consumption portion of value income, the average of total annual income per farm household is VND12.2 million and the portion of value income is 39% in average. This value income portion is high in Northwest (45%) and Nam Nam (49%) Areas, while it is low in Nam Dan Area (23%). The proportion of agricultural cash income to the total annual income is 33% in average and lower for Nam Dan Area (18%).

An average annual income per person of VND2.3 million is obtained by dividing the average income with the average number of family members (5.3 persons) to obtain an average of annual income per person of VND2.3 million. Compared with the poverty line of VND1.1 million which was set in the World Bank Study in 1995, the average annual income is more than double of the level. However, the income level of each family differs from one another and the proportion of the families whose income levels are under the poverty level is calculated as 21%. In general, the average income of Plain Area is high, and that of Northwest and Nam Nam Areas are low.

The average annual expenditure of Nam Dan Area is the highest (VND12.9 million) and the proportion of cash expenditure is 76% which is higher than that of other areas. The annual expenditure second to the level of Nam Dan Area is the one of Plain Area (VND11.5 million) and the expenditure levels of other areas are approximately equal to a level of VND7.7 million. This VND7.7 million may indicate a minimum living cost level for the families living in the Study Area. Notably, the difference between income and expenditure is the smallest for Nam Dan Area (VND0.7 million) and relatively

high for Mountain Area (VND5.1 million) and Right Plain Area (VND4.4 million). The income and expenditure for each area are summarized in the following figure:



The economic condition of each area is characterized as follows:

Northwest/Nam Nam	: low income level and low expenditure level
Mountain/Right Plain	: medium income level and low expenditure level relatively high level of income/expenditure difference
Plain	: high income level and high expenditure level and large proportion of value expenditure
Nam Dan	: relatively high income level and high expenditure level, large proportion of income by other than agriculture, and large proportion of cash expenditure

M.3.4 Farmers' Intention

The farmers living in the Study Area recognize that issues related to "irrigation water" (31%) and "production cost" (26%) are the two major problems for their agricultural production. Other issues are "poor soil fertility" (19%) and "damage caused by insect, disease, etc." (14%). The problems they recognize for marketing farm products are "low selling price"(31%), "transportation to markets"(20%) and "seasonal fluctuation of selling prices"(19%).

The farmers' ideas for increasing their income are "to introduce new crops" (45%), "to expand farming scale" (28%), "to add value to produce by processing" (13%) and "to change marketing method" (12%). Regarding the ideas for enlarging their farm scale, 28% of the farmers consider "purchasing land use rights" and 10% of the farmers consider "cooperate with other farmers". Kind of crops and/or livestock that the farmers intend to

introduce are "rice"(41%), "fish"(27%) and "poultry"(10%). Fifty five percent of the farmers recognize "capital" as the most common problem for production expansion, followed by "skill and technique" (33%) and "marketing" (11%).

The farmers have ideas of improving their marketing channels by "selling directly to consumers" (38%), "selling directly to processors" (25%), "selling directly to whole sellers/retailers" (17%), and "selling to intermediates at farm" (16%). For improving condition of farming field, the farmers intend "to improve/provide access roads" (34%) and "to rehabilitate irrigation canals" (30%). The survey results show that the farmers consider agricultural machinery as necessary for "tilling"(42%) and "transportation"(33%). On the other hand, their interest for machinery for post-harvest practices is low. Under present conditions, it takes about 25 days for tilling work; working hours for farmers for this work is estimated to be more than 10 hours per day. It is considered that the farmers' needs for the mitigation of such heavy work load is high.

Regarding official credit services, 98% of the farmers know about the services and 90% of them have experience in receiving loans through the services. The farmers request the credit services institutions to "raise limitation of debt amount" (36%), "lower interest" (34%) and "extend terms" (21%).The survey results show that the farmers request to extension services authorities to "intensify door to door technical services" (42%), "supply information an cropping" (22%) and "increase demonstration plots" (20%).