The festivals are concentrated before and after the New Year of lunar calendar, and the temple or shrine in the area is center of such festivals. In some cases, many people from Ha Noi and other areas are visiting for such festivals which are opening different stalls and shows. There are some trend to review such festivals of ancestor worship or fork song competition as a measure of activation of rural community, and it will also be possible to develop as a tourism resource in future.

7) Sense of inhabitant

It is assumed that the problem of income gap is rather serious recently as the result of village survey show that most of villager are feeling unsatisfactory to the low income. The dissatisfaction and anxiety to educational facilities, road and transportation, and medical facilities are also rather serious, and appealing shortage of social infrastructure vaguely. The problem of shortage of employment opportunity is grasped as reason of low income, and low cultural level is recognized as basic reason of those above problems.

The above mentioned trend of sense is also related to the problems in farming activities, grasping the low educational level as reason of dullness of agriculture. Water logging, defect of hydraulic facilities, shortage of water, etc. are judged as outer reasons of dullness of agriculture, and appealing the shortage of development fund as the reason of those problems.

The villagers are also recognizing the difficulties of road transportation as a mean of bringing out the farm products or access to the market. Moreover, they have dissatisfaction to the low price of farm products. The dissatisfaction and anxiety to shortage of farmland, high duties of water, supply of seed, fertilizer and other agri-input as well as poor land conditions are also rather serious.

In general, the villagers are precisely grasping the internal and outer reasons of stagnation of social and productive activities in the area and, in the other words, the sense of inhabitants is considered as rather high level.

G-6 Outlook of Rural Life in the Project Area

1) Housing and life style

The standard type of residential unit is brick wall, tiled roof and 2-3 rooms, but some houses of bamboo reinforced mud wall with straw roof are also remained. 17% of houses have been built in 1960s or before, 30% in 70s, 30% in 80s and 23% have been built in 90s. It is notable that 42% of houses are renovated since 1985 showing a boom of house renovation.

Most of villagers are obtaining water for domestic use from shallow hand dug wells, but people in Han Quang are using canal water for their domestic use.

99% of inhabitants are enjoying electric lighting and 86% of rural families have electric fan, moreover, 63% of families have TV. The holder of radio is 59%, but 39% have TV and radio together, while 20% have only radio. The rate of diffusion of TV was only 7% in 1980s but it became as much as 9 times after 1990. The diffusion rate of radio in 1980s was, in fact, only 23%. Refregerator and air conditioner are not yet popular in the area.

As fuel for cooking, the rice straw is very important, and 38% of families are using straw as sole fuel for cooking while 31% are straw and coal, 12% are straw and wood, and 10% are combination of straw and briquette, wood, coal, rice husk, etc., therefore 91% of families are using straw, in different forms, as fuel for cooking. The straw is not only self production, but many families are buying straw as fuel.

94% of rural families has bicycle, and 15% have more than 2 bicycles. Most of them have been bought in 1980s, and it may say that 1980 is beginning of bicycle era in the area. The diffusion of motor-bike started since the end of 1980s, and 17% of families are owner of motor-bike nowaday, however the owner of motor vehicle is very limitted.

2) Income and expenditure including debt

42% of families have deficit in their home economy, and 19% have debt, too. Such trend is remarkable at the southern and eastern areas of the Project Area. The families who have deficit in their home economy are supporting their livelihood with self producing foodstuff. Although they are refunding a part of their debt at the time of harvesting, many families borrow again to supplement the deficit in daily payment.

The paddy rice is main income source for 53% of farming families, but the remained 47% are depending on the income of sale of pig or other non-farming works.

Dispite of self production of main portion of foodstuff, the top payment item in home economy is foods/seasoning. Payment for cloth, tabacco/drink, etc. are following to food items, and payment for costs of fuel for cooking and electricity are also a pressure on the home economy.

For those families who have debt, the payment of interest is heavy load on the home economy, because the interest rates are as high as 2.5-5.0% per month.

Meanwhile, 12% of families are counting surplus of payment of more than 3 million dongs but, contrarily, 18% of families are counting deficit of more than one million dongs.

3) Foods and nutrient

Annual consumption of rice grain is 154-224kg/capita, but actual consumption of rice is 164-228kg/capita because many families are consuming rice noodle and rice flour other than grain rice. Moreover, many families are eating, mainly as breakfast, 2-10kg of glutinous rice, therefore it is to say that the inhabitants of the area are maintaining rice-oriented food life. Main portion of rice is self production, but buying about 3% of total consumption.

The animal protein and fat are mainly ingested from 4.5-18 kg of pork meat and fat. It is also supplemented with chicken and other white meats, but the quantity is only 0.6-7.8kg/annum.

Some families are supplementing their food life with ground nuts, soya bean, green bean and other pulse together with bean curd, sesame, etc., but the ratio of such families are rather limitted. Consumption of potato and sweet potato is also not so popular.

The fiber and a part of vitamine are supplied with different kinds of vegetables which is ingested 98kg/annum in average, but the quantity of ingestion is greatly differred amongst the villages and families.

The consumption of sugar is 1.8-6.2kg/annum as average of village basis, but that of salt is differred by village considerably ranging from 2.8 to 20kg/annum. The preserved foods with sugar or salt such as jam, pickles, etc. are not so popular.

In general, the food life of the inhabitant of the area is rather inclined to the carbohydrate component, and it is assumed that such unbalance of nutrient is one of the reasons of high occurrence of tuberculosis.

4) Productive activities

94% of farming families are applying double cropping of paddy in very intensive farming with large quantity of labor input of 215-764 man-day/ha per one cropping season. If the mean working hour per day is estimated as 6 hours, the labor input is 1,290-4,584 hours/ha, or the average labor input is 412 man-day/ha or 2,472 hours/ha, therefore it is possible to say that the labor productivity in the area is very poor. The reasons of such low productivity of labor are due to small scale of land holding, which is dividing into many scattered plots, per farming families, high dependence on man-power for bringing-in of manure, chemical fertilizer, etc. and bringing-out of harvested crops to/from the field and, moreover, the lifting up of the irrigation water from canal to field is also depending on man-power. Furthermore, the farming schedule is rather tight and different works are often duplicated, e.g., the related works of dry season paddy-culture are done from the begining of October to the end of June, but the works of wet season paddy start from the begining of May to end at the mid of December, therefore it is rather difficult to apply crop diversification except those large families who have sufficient labor force.

Consequently, the number of farming families who can cultivate other crops than paddy rice is rather limitted, and livestock farming such as pig breeding is also not grown as expected. 90% of farming families have 3.5 heads of pig in average, but age of 80% of pig are less than 6 months.

In conclusion, the improvement of home economy of farming families is hardly possible without such effort of crop diversification and promotion of livestock farming, therefore reduction of labor load in paddy-culture by means of introduction of cooperative use of farming machinery or contract system of farming works, because the farm mechanization of individual farming families is almostly impossible under present situation of the area.

G-7 Consolidation Plan of Farmer's Organization

Following procedures will be applicable at the consolidation of farmer's cooperative in the Study Area:

(1) Confirmation of existing conditions--number of members, number of their family, area of farmland cultivated by member, actual cropping area, actuality of livestock/poultry farming, kind and quantity of agri-put applied, kind and quantity of daily consumption to be procured from out of area, capital supply from out of area, and grasp of other conditions related to production and consumption.

(2) Confirmation of demands--demands related to production, consumption, money supply, etc.

(3) Consensus related to unification with other cooperative--in case many cooperatives of small size are existing in a commune, it is recommendable to be unified with neighboring cooperatives. However, such unification shall be implemented under the consensus of members of both cooperatives concerned. The unification shall not be forced without members' consensus.

(4) Consensus related to extent of joint activities--to specify the subject of joint activities based on the confirmed demands, and to define the extent of joint activities agreeable by all members.

(5) Consensus related to operation of organization--to form consensus on location & facilities of office, number of permanent employee, the right & duty of managing staff and method of election of them, etc.

(6) Revision of article of association--to activate the cooperative's activities, the existing article of association shall be revised based on the above item 3) and 4).

(7) Election of managing staff and decision of operation system--to elect number of managing staff based on the revised article of association, and elected managing staff shall provide the operation system according to the procedures defined in the article of association.

(8) Negotiation with authorities concerned--to negotiate with manufacturers or dealers of agri-input, farm machinery, consumptive goods, etc., related authorities of agricultural development or improvement, agriculture development bank, etc. in accordance with the above mentioned operation system for concluding contracts for procurement, credit supply, etc.

(9) Supportiong services to cooperative--the public authorities shall support such farmer's organization by mean of positive response to their reference within the legal framework. In case the prevailing regulation is not covering the requirement of the cooperative activities, then the review of related regulations is also to be considered.

G-8 Rural Community Activating Plan

1) Improvement of productive activities--the basic condition to activate the rural communmity in the Study Area is the improve-

ment of productive activities including agriculture, and positive participation of farmer themselves is unavoidable to fulfill such condition. From such point of view, the solution should be sought in the consolidation plan of farmer's organization mentioned in the para. 4.4.3 of the Main Report. It is possible to activate the regional economy if the activities of farmer's cooperatives are extended, without limiting in the farming works, to agri-product processing and marketing, which create new employment opportunity in rural area.

2) Improvement of educational and cultural facilities--the improvement of educational facilities and their multi-purpose uses mentioned in the para.4.6.5 of Main Report is also related to activate rural community.

The conservation of traditional culture will play very important role as a part of cultural activities. The different traditional festival will strength the social solidarity of the inhabitant, and it will provide favorable effect to the productive activities of cooperative system. On the other hand, the cultural activities will accelerate the interchange with inhabitant of other villages, and such interchange will be very useful for activating the rural community.

Especially, the activation of cultural activities is very effective to moderate the gap or confrontation among the age groups which is often causing the stagnation of rural community, therefore the cultural activities in rural area should be re-evaluated from the viewpoint of activation of rural community.

3) Introduction of tourism--it will be possible to introduce the tourism development as a measure of activation of rural community. In general, the touristic places are classified into two types of sight seeing and recreation, and the former aims to enjoy natural scene, historical relics, etc., while the latter is for recreating by means of sea bathing, climbing, playing golf, etc., or for staying at the place to avoid hot summer or cold winter.

The Study Area is a rural area nearby the capital city of Hanoi having enough rooms to be developped as sight-seeing type touristic place with many historic temples/shrines, traditional rows of houses which remain the architect of pre- French colonial period, or festivals of different type held by villages, which are considered as potential touristic resources to a-day-visit tourists of internal and external who visit capital city.

The touristic development aims to create new employment opportunity in the area or to increase or expand the volume of consumption within the area by means of receiving visitors from outside. Namely, it is necessary to cause the increase of income of the area with creation of new employment at rest house and restaurant for the visitors or the increase of sale of the products of the area to the visitors who will buy such products as a memory of their visiting. To achieve such target, it is necessary to review the quality of services to receive tourist or to consider the application of required education or training of people for avoiding the hard selling or extortion which is often seen at the surrounding area of some of temples in the Study Area.

From the above mentioned point of view, it is unavoidable conditions that the selection of route of sight seeing based on the existing temples, historical relics festivals, etc. should

be done jointly by persons concerned of all districts in the Study Area, then endeavour to invite tourists keeping close contact with tourism agencies and hotels in Hanoi. By the other word, the separate pursuance by commune or district basis for touristic development is not effective, and region basis collaboration is first requirement in this concern.

4) Improvement of infrastructure for activating rural community --the improvement of road networks and safety measurement thereon are a common requirement for the above mentioned improvement of productive activities, improvement of educational and cultural facilities, and/or introduction of tourism. The road traffic increases naturally according to the internal reason such as activation of productive and cultural activities. Moreover, the promotion of tourism will cause more traffic as visitors from out -side. The present road networks are qualitatively not sufficient -ly to cope with such increase, and serious increase of accident is foreseeable. Taking such problems as mentioned above into account, expansion of width of road, pavement, installation of signals and road marks, etc. will become as minimal necessity.

FIGURE G.1-1: ADMINISTRATIVE BOUNDARY OF STUDY AREA

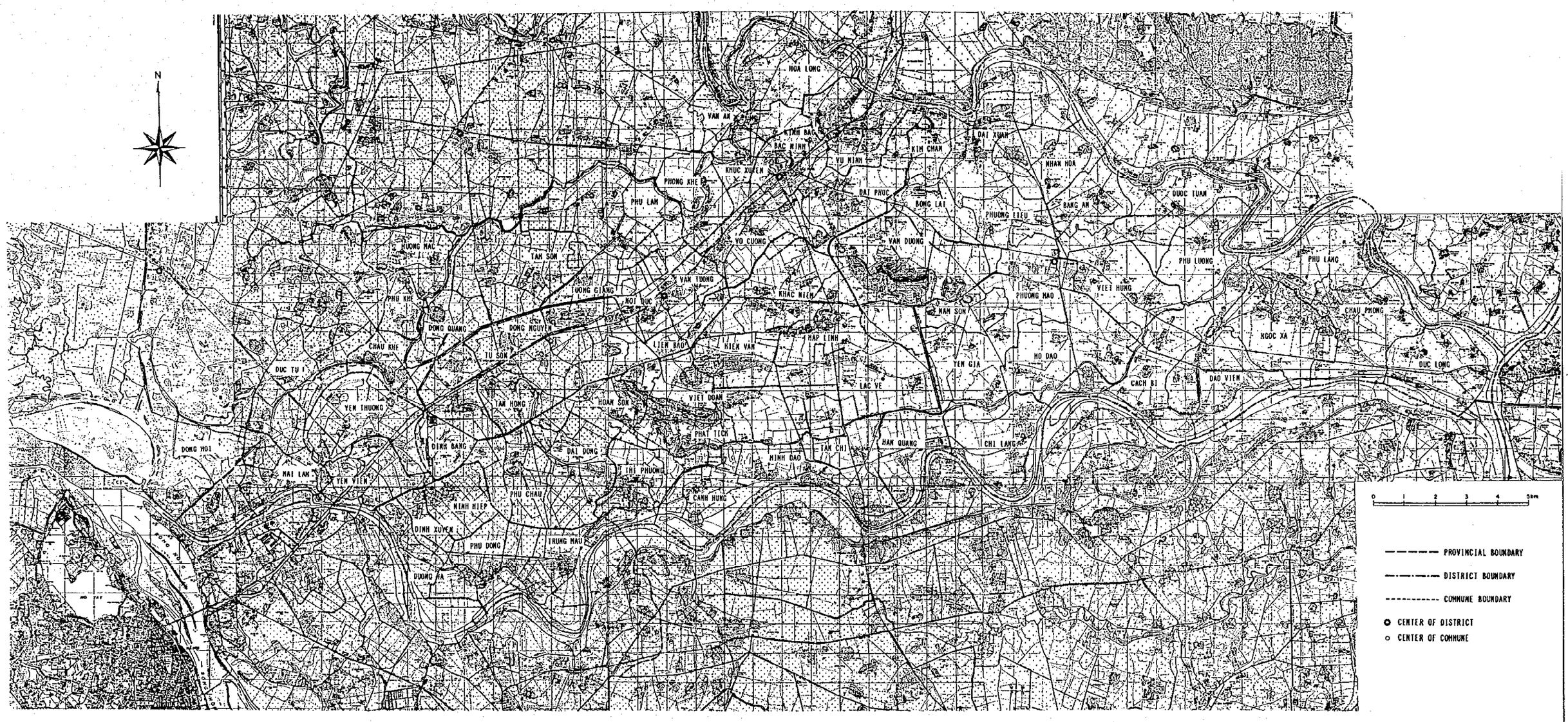

TABLE G.2-1 POPULATION DISTRIBUTION IN SOUTH BAC DUONG AGRICULTURAL AREA IN 1990

SUB-AREA / NAME OF COMMUNES	SUB-AREA (1)	SUB-AREA (2)	SUB-AREA (3.1)	SUB-AREA (3.2)	SUB-AREA (4)	SUB-AREA (5)	TOTAL AREA	OUT OF STUDY AREA
DUC TU	1,402						1,402	9,698
MAI LAM	7,467						7,467	
DONG HOI	5,015						5,015	2,404
TOTAL/DONG ANH	13,884						13,884	12,102
DINH XUYEN	6,133						6,133	
NINH HIEP	10,077						10,077	
PHU DONG	9,295						9,295	
TRUNG MAU	3,969						3,969	
DUONG HA	4,031						4,031	
YEN THUONG	11,080						11,080	
YEN VIEN	9,254						9,254	
TOTAL/GIA LAM	53,839						53,839	
TU SON			2,540				2,540	
CANH HUNG			4,541				4,541	
CHAU KHE	1,410	2,350					3,760	5,646
DAI DONG			8,100				8,100	
DONG NGUYEN		6,817	4,545				11,362	
DONG QUANG		12,901					12,901	
DINH BANG	3,194	640	8,943				12,777	
HAP LINH			5,042				5,042	
HUONG MAC			9,229				9,229	
HIEN VAN			4,707				4,707	
HOAN SON			6,712				6,712	
KHAC NIEM			3,364		4,112		7,476	
LIEN BAO			2,840		4,258		7,098	
LAC VE			9,108				9,108	
MINH DAO			4,845				4,845	
NOI DUC		570	2,280		2,851		5,701	
PHU LAM		9,907					9,907	
PHAT TICH			4,560				4,560	
PHU CHAU			5,763				5,763	
PHU KHE			5,380				5,380	
TAM SON			7,775				7,775	
TAN HONG			10,500				10,500	
TAN CHI			6,609				6,609	
THI PHUONG			5,819				5,819	
TUONG GIANG		7,178					7,178	
VAN TUONG		1,216			6,890		8,106	
VIET DOAN			7,884				7,884	
TOTAL/TIEN SON	4,604	41,579	131,086		18,111		195,380	5,646

SUB-AREA / NAME OF COMMUNES	SUB-AREA (1)	SUB-AREA (2)	SUB-AREA (3.1)	SUB-AREA (3.2)	SUB-AREA (4)	SUB-AREA (5)	TOTAL AREA	OUT OF STUDY AREA
BANG AN				1,142	2,120		3,262	
BONG LAI					6,037		6,037	
CACH BI				4,577			4,577	
CHI LANG				6,851			6,851	
CHAU PHONG						5,270	5,270	
DUC LONG						5,245	5,245	
DAO VIEN						8,603	8,603	
DAI XUAN					7,402		7,402	
HAN QUANG			3,564				3,564	
KIM CHAN					3,470		3,470	
MO DAO				3,515			3,515	
NHAN HOA					5,893		5,893	
NAM SON			*	1,937	4,521		6,458	
NGOC XA						6,948	6,948	
PHUONG MAO				6,572			6,572	
PHUONG LIEU					6,057		6,057	
PHU LANG						6,361	6,361	
PHU LUONG				4,138			4,138	
QUOC TUAN				4,684			4,684	
VAN DUONG					4,181		4,181	
VIET HUNG				9,219			9,219	
VIET THONG					4,376		4,376	
YEN GIA				3,446			3,446	
TOTAL/QUE VO			3,564	46,081	44,057	32,427	126,129	
HOA LONG		7,578					7,578	
VAN AN		4,513					4,513	484
KHUC XUYEN		1,929					1,929	777
PHONG KHE		5,550					5,550	542
TOTAL/YEN PHONG		19,570					19,570	1,803
BAC NINH		32,157			1,692		3,849	
VU NINH		2,738			6,391		9,129	
KINH BAC		4,105			*		4,105	
DAI PHUC					7,335		7,335	
VO CUONG		*			9,732		9,732	
TOTAL/BAC NINH		39,000			25,150		64,150	
GRAND TOTAL	72,327	100,149	134,650	46,081	87,318	32,427	472,952	
AREA(km²)	48.2	59.8	85.4	90.6	76.0	40.2	400.2	
POPULATION DENSITY PER Km²	1,500	1,675	1,577	508	1,149	807	1,182	

TABLE G.2-2: DISTRIBUTION OF POPULATION BY ETHNIC GROUP

Ethnic group	All country	Que Vo	Bac Ninh	Yen Phong	Tien Son	Dong Anh	Gia Lam
Kinh (Viet)	55,900,224	126,043	63,762	114,614	200,792	212,879	260,032
Tay	1,190,342	38	163	19	119	93	296
Thai	1,040,549	-	8	1	11	8	11
Hoa (Han)	900,185	4	69	6	15	12	76
Kho-me	895,299	-	-	-	-	4	5
Muong	914,596	2	8	4	-	20	39
Nung	705,709	11	85	12	55	15	70
H'mong (Meo)	558,053	-	-	1	-	-	1
Dao	473,945	2	-	-	1	-	8
Gia-rai	242,291	1	-	-	1	2	2
E-de	194,710	-	-	1	1	-	5
Xo-dang	96,766	-	-	-	-	2	-
San Chay	114,012	-	5	2	6	4	15
San Diu	94,630	-	4	-	3	-	15
Hre	94,259	-	-	-	-	-	4
Ra-glai	71,696	-	-	-	-	-	3
Xtieng	50,194	-	-	-	-	-	1
Bru-Van Kieu	40,132	1	-	-	-	-	3
Tho	51,274	-	1	-	2	-	18
Giay	37,964	-	-	1	-	-	6
Co-tu	36,967	-	-	-	-	1	-
Ta-oi	26,044	-	-	-	-	-	1
Lao	9,614	-	-	-	-	-	1
Others/ not classified	636,307	27	45	14	17	52	56
TOTAL	64,375,762	126,129	64,150	114,675	201,026	213,092	260,668

TABLE G.2-3: POPULATION DISTRIBUTION BY AGE GROUP

(1) Whole Population:

Age Group	All country	Que Vo	Bac Ninh	Yen Phong	Tien Son	Dong Anh	Gia Lam
0- 4	9,084,202	20,233	7,494	17,892	27,669	25,758	26,361
5- 9	8,606,693	18,113	8,155	16,318	27,630	29,128	31,677
10-14	7,531,703	15,588	7,573	13,956	24,483	26,202	31,392
15-19	6,805,682	11,942	6,657	11,289	20,327	21,496	25,799
20-24	6,044,159	10,115	5,217	9,253	16,745	17,102	20,120
25-29	5,707,769	11,478	6,092	10,558	18,496	20,446	26,236
30-34	4,701,958	8,663	5,571	8,245	14,402	16,999	21,955
35-39	3,286,643	5,390	3,976	5,167	9,019	10,817	14,969
40-44	2,201,498	3,872	3,146	3,850	6,800	8,264	11,871
45-49	1,940,084	4,335	2,212	3,613	6,808	7,748	10,055
50-54	1,913,138	3,843	1,941	3,556	6,536	7,076	9,710
55-59	1,945,438	3,616	1,877	3,277	6,679	6,763	9,264
60-64	1,566,239	3,142	1,413	2,504	5,423	5,363	7,285
65-69	1,231,761	2,569	1,106	2,221	4,272	4,257	5,645
70-74	800,848	1,542	733	1,339	2,670	2,865	3,647
75-79	562,086	1,105	582	889	1,931		2,626
80-84	283,175	419	297	327	846		1,339
85 over	156,433	159	108	123	289		648
not stated	6,253	5	0	0	1		69
TOTAL	64,375,762	126,129	64,150	114,675	201,026	213,092	260,668

(2) Male Population:

0- 4	4,664,930	10,434	3,885	9,235	14,214	13,226	13,352
5- 9	4,392,635	9,318	4,163	8,334	14,396	14,917	16,429
10-14	3,856,862	7,947	3,838	7,081	12,582	13,262	16,188
15-19	3,357,696	5,706	3,203	5,378	9,633	10,474	12,601
20-24	2,896,412	4,205	2,305	3,860	7,214	7,348	9,075
25-29	2,721,260	5,325	2,972	4,981	8,719	9,744	12,740
30-34	2,245,480	3,906	2,641	3,746	6,662	8,099	10,583
35-39	1,534,662	2,314	1,774	2,293	3,933	4,898	6,832
40-44	1,021,370	1,768	1,453	1,752	3,015	3,960	5,825
45-49	871,383	1,683	1,108	1,624	3,003	3,546	5,048
50-54	853,228	1,708	975	1,617	2,986	3,327	4,714
55-59	898,469	1,632	878	1,454	3,065	3,128	4,410
60-64	709,586	1,332	663	1,126	2,223	2,191	3,284
65-69	523,917	986	427	845	1,622	1,595	2,229
70-74	324,803	561	246	434	886	955	1,309
75-79	212,291	355	167	251	581		775
80-84	94,868	105	80	79	199		309
85 over	47,333	27	18	21	51		132
not stated	3,552	1	0	0	0		43
TOTAL	31,230,737	59,518	30,796	54,111	94,986	101,532	125,878

(3) Female Population:

Age group	All country	Que Vo	Bac Ninh	Yen Phong	Tien Son	Dong Anh	Gia Lam
0- 4	4,419,272	9,799	3,609	8,657	13,455	12,532	13,009
5- 9	4,214,058	8,795	3,992	7,984	13,234	14,211	15,248
10-14	3,674,841	7,641	3,735	6,873	11,901	12,940	15,204
15-19	3,447,986	6,236	3,454	5,911	10,694	11,022	13,198
20-24	3,147,747	5,910	2,912	5,393	9,531	9,754	11,045
25-29	2,986,509	6,153	3,120	5,577	9,777	10,702	13,496
30-34	2,456,478	4,757	2,930	4,499	7,740	8,900	11,372
35-39	1,751,981	3,076	2,202	2,874	5,086	5,919	8,137
40-44	1,180,128	2,104	1,693	2,098	3,785	4,304	6,046
45-49	1,068,701	2,447	1,104	1,989	3,805	3,802	5,007
50-54	1,059,910	2,135	966	1,939	3,550	3,749	4,996
55-59	1,046,969	1,984	999	1,823	3,614	3,635	4,854
60-64	856,653	1,810	750	1,678	3,200	3,172	4,001
65-69	707,844	1,583	679	1,376	2,650	2,662	3,416
70-74	476,045	981	487	905	1,784	1,910	2,338
75-79	349,795	750	415	638	1,350		1,851
80-84	188,307	314	217	248	647		1,030
85 over	109,100	132	90	102	238		516
not stated	2,701	4	0	0	1		26
TOTAL	33,145,025	66,611	33,354	60,564	106,042	111,560	134,790

TABLE G.2-4: SIZE OF HOUSEHOLD AND MALE:FEMALE RATIO BY COMMUNES

NAME OF COMMUNES	POPULATION			NO. OF HOUSEHOLD	SIZE OF HOUSEHOLD	MALE: FEMALE RATIO
	TOTAL	MALE	FEMALE			
DUC TU	11,100	5,244	5,856	2,475	4.48	47.2:52.8
MAI LAM	7,467	3,536	3,931	1,739	4.29	47.4:52.6
DONG HOI	7,419	3,469	3,950	1,657	4.48	46.8:53.2
TOTAL/DONG ANH	213,092	102,532	110,560	46,878	4.55	48.1:51.9
DINH XUYEN	6,133	3,037	3,096	1,284	4.78	49.5:50.5
NINH HIEP	10,077	4,873	5,204	2,023	4.98	48.4:51.6
PHU DONG	9,295	4,302	4,993	2,365	3.93	46.3:53.7
TRUNG MAU	3,969	1,860	2,109	919	4.32	46.9:53.1
DUONG HA	4,031	1,895	2,136	925	4.36	47.0:53.0
YEN THUONG	11,080	5,271	5,809	2,422	4.57	47.6:52.4
YEN VIEN	9,254	4,629	4,625	1,973	4.69	50.0:50.0
TOTAL/GIA LAM	260,668	125,878	134,790	60,409	4.32	48.3:51.7
TOTAL/HO NOI	3,056,146	1,476,016	1,580,130	703,946	4.34	48.3:51.7
TU SON	2,540	1,182	1,358	574	4.43	46.5:53.5
CANH HUNG	4,541	2,049	2,492	1,006	4.51	45.1:54.9
CHAU KHE	9,406	4,493	4,913	2,062	4.56	47.8:52.2
DAI DONG	8,100	3,790	4,310	1,951	4.15	46.8:53.2
DONG NGUYEN	11,362	5,380	5,982	2,540	4.47	47.4:52.6
DONG QUANG	12,901	6,283	6,618	2,550	5.06	48.7:51.3
DINH BANG	12,777	6,357	6,420	2,782	4.59	49.8:50.2
HAP LINH	5,042	2,409	2,633	1,106	4.56	47.8:52.2
HUONG MAC	9,229	4,500	4,729	1,947	4.74	48.8:51.2
HIEN VAN	4,707	2,108	2,599	1,110	4.24	44.8:55.2
HOAN SON	6,712	3,074	3,638	1,642	4.09	45.8:54.2
KHAC NIEM	7,476	3,595	3,881	1,503	4.97	48.1:51.9
LIEN BAO	7,098	3,292	3,806	1,688	4.20	46.4:53.6
LAC VE	9,108	4,217	4,891	2,084	4.37	46.3:53.7
MINH DAO	4,845	2,233	2,612	1,160	4.18	46.1:53.9
NOI DUC	5,701	2,697	3,004	1,177	4.84	47.3:52.7
PHU LAM	9,907	4,782	5,125	2,290	4.33	48.3:51.7
PHAT TICH	4,560	2,129	2,431	1,105	4.13	46.7:53.3
PHU CHAU	5,763	2,637	3,126	1,338	4.31	45.8:54.2
PHU KHE	5,380	2,593	2,787	1,197	4.49	48.2:51.8
TAM SON	7,775	3,606	4,169	1,926	4.04	46.4:53.6
TAN HONG	10,500	4,931	5,569	2,348	4.47	47.0:53.0
TAN CHI	6,609	3,057	3,552	1,396	4.73	46.3:53.7
THI PHUONG	5,819	2,726	3,093	1,334	4.36	46.8:53.2
TUONG GIANG	7,178	3,302	3,876	1,780	4.03	46.0:54.0
VAN TUONG	8,106	3,855	4,251	1,634	4.96	47.6:52.4
VIET DOAN	7,884	3,707	4,177	1,845	4.27	47.0:53.0
TOTAL/TIEN SON	201,026	94,984	106,042	45,075	4.46	47.2:52.8

NAME OF COMMUNES	POPULATION			NO. OF HOUSEHOLD	SIZE OF HOUSEHOLD	MALE:FEMALE RATIO
	TOTAL	MALE	FEMALE			
BANG AN	3,262	1,498	1,764	618	5.28	45.9:54.1
BONG LAI	6,037	2,839	3,198	1,303	4.63	47.0:53.0
CACH BI	4,577	2,101	2,476	1,013	4.52	45.9:54.1
CHI LANG	6,851	3,080	3,771	1,519	4.51	45.0:55.0
CHAU PHONG	5,270	2,469	2,801	1,226	4.30	46.9:53.1
DUC LONG	5,245	2,484	2,761	1,184	4.43	47.4:52.6
DAO VIEN	8,603	4,107	4,496	1,959	4.39	47.7:52.3
DAI XUAN	7,402	3,476	3,923	1,436	5.15	47.0:53.0
HAN QUANG	3,564	1,674	1,890	791	4.51	47.0:53.0
KIM CHAN	3,470	1,654	1,816	715	4.85	47.7:52.3
MO DAO	3,515	1,662	1,853	782	4.49	47.3:52.7
NHAN HOA	5,893	2,802	3,091	1,179	5.00	47.5:52.5
NAM SON	6,458	3,020	3,438	1,352	4.78	46.8:53.2
NGOC XA	6,948	3,314	3,634	1,557	4.46	47.7:52.3
PHUONG MAO	6,572	3,294	3,278	1,336	4.92	50.1:49.9
PHUONG LIEU	6,057	2,932	3,125	1,266	4.78	48.4:51.6
PHU LANG	6,361	2,975	3,386	1,427	4.46	46.8:53.2
PHU LUONG	4,138	1,984	2,154	868	4.77	47.9:52.01
QUOC TUAN	4,684	2,231	2,453	979	4.78	47.6:52.4
VAN DUONG	4,181	2,009	2,172	877	4.77	48.1:51.9
VIET HUNG	9,219	4,262	4,957	1,925	4.79	46.2:53.8
VIET THONG	4,376	2,068	2,308	829	5.28	47.3:52.7
YEN GIA	3,446	1,580	1,866	816	4.21	45.9:54.1
TOTAL/QUE VO	126,129	59,518	66,611	26,957	4.68	47.2:52.8
HOA LONG	7,578	3,545	4,033	1,586	4.78	46.8:53.2
VAN AN	4,997	2,337	2,660	1,035	4.83	46.8:53.2
KHUC XUYEN	2,706	1,282	1,424	597	4.53	47.4:52.6
PHONG KHE	6,092	2,948	3,144	1,332	4.57	48.4:51.6
TOTAL/YEN PHONG	114,675	54,111	60,564	23,780	4.82	47.2:52.8
BAC NINH	33,849	15,907	17,942	7,565	4.47	47.0:53.0
VU NINH	9,129	4,626	4,503	1,821	5.01	50.7:49.3
KINH BAC	4,105	1,856	2,249	876	4.69	45.2:54.8
DAI PHUC	7,335	3,728	3,607	1,372	5.35	50.8:49.2
VO CUONG	9,732	4,679	5,053	2,145	4.54	48.1:51.9
TOTAL/BAC NINH	64,150	30,796	33,354	13,779	4.66	48.0:52.0
TOTAL/HA BAC	2,064,439	985,009	1,079,430	446,862	4.62	47.7:52.3

TABLE G.2-5: POPULATION 13 YEARS OF AGE AND OVER BY AGE GROUP AND MARITAL STATUS

(1) Total Population

Age group	Total	Single	Married	Widowed	Divorced	Separated	Not stated
13-14	2,969,207	2,952,057	16,660	279	-	211	-
15-17	4,206,366	4,070,930	125,432	1,012	-	1,150	7,842
18-19	2,599,316	2,180,984	407,755	2,229	2,234	3,626	2,488
20-24	6,044,159	3,140,857	2,835,038	17,597	20,633	26,226	3,808
25-29	5,707,769	1,157,306	4,426,758	41,353	41,026	37,397	3,929
30-34	4,701,958	441,202	4,104,558	70,432	45,149	37,358	3,259
35-39	3,286,643	199,293	2,916,207	105,216	34,016	29,571	2,340
40-44	2,201,498	88,815	1,931,225	136,221	22,610	21,087	1,540
45-49	1,940,084	47,537	1,661,466	194,113	17,435	18,340	1,193
50-54	1,913,138	31,442	1,603,953	247,612	12,064	17,043	1,024
55-59	1,945,438	24,922	1,584,530	310,932	8,400	15,611	1,043
60-	4,600,542	51,373	2,808,605	1,696,384	10,124	30,732	3,324
not stated	6,253	265	328	2	1	-	5,657
total	42,122,371	14,386,983	24,422,515	2,823,382	213,692	238,352	37,447

(2) Male Population

13-14	1,525,286	1,517,693	7,413	74	-	106	-
15-17	2,114,352	2,070,912	38,688	216	-	351	4,185
18-19	1,243,344	1,129,196	111,245	366	462	828	1,247
20-24	2,896,412	1,805,435	1,073,726	2,786	4,970	7,692	1,803
25-29	2,721,260	628,757	2,064,069	6,051	9,606	10,712	2,065
30-34	2,245,480	169,335	2,048,401	7,695	9,542	8,714	1,793
35-39	1,534,662	50,581	1,462,717	8,253	6,104	5,821	1,186
40-44	1,021,370	19,774	983,632	9,441	4,035	3,757	731
45-49	871,383	11,994	836,412	14,844	3,906	3,654	573
50-54	853,228	8,825	811,639	24,827	3,113	4,335	489
55-59	898,469	7,836	841,788	41,510	2,464	4,476	395
60-	1,912,798	15,959	1,600,180	282,307	3,169	10,213	970
not stated	3,552	170	254	2	1	-	3,125
total	19,841,596	7,436,467	11,880,164	398,372	47,372	60,659	18,562

(3) Female Population

13-14	1,443,921	1,434,364	9,247	205	-	105	-
15-17	2,092,014	2,000,018	86,744	796	-	799	3,657
18-19	1,355,972	1,051,788	296,510	1,863	1,772	2,798	1,241
20-24	3,147,747	1,335,422	1,761,312	14,811	15,663	18,534	2,005
25-29	2,986,509	528,549	2,362,689	35,302	31,420	26,685	1,864
30-34	2,456,478	271,867	2,056,157	62,737	35,607	28,644	1,466
35-39	1,751,981	148,712	1,453,490	96,963	27,912	23,750	1,154
40-44	1,180,128	69,041	947,593	126,780	18,575	17,330	809
45-49	1,068,701	35,543	825,054	179,269	13,529	14,686	620
50-54	1,059,910	22,617	792,314	222,785	8,951	12,708	535
55-59	1,046,969	17,086	742,742	269,422	5,936	11,135	648
60-	2,687,744	35,414	1,208,425	1,414,077	6,955	20,519	2,354
not stated	2,701	95	74	-	-	-	2,532
total	22,280,775	6,950,516	12,542,351	2,425,010	166,320	177,693	18,885

APPENDIX H

ENVIRONMENTAL STUDY

APPENDIX H

ENVIRONMENTAL STUDY

CONTENTS

H－1. Introduction

This Appendix presents the results of environmental study made by JICA Study Team (Environmentalist) during the Study on Improvement Project of Drainage System in South Bac Doung Agricultural Area in The Socialist Republic of Viet Nam.

Major study activities made in the environmental study are as follows:

(1) Field reconnaissance

1) Phase I Study

The field reconnaissance survey in and around the Study Area was carried out to make rough observation of the following matters.

- The land use
- The water-logging areas
- The existing irrigation and drainage facilities
- The present condition of inhabitants etc.

2) Phase II Study

In the Phase II Study, the field reconnaissance survey in and around the Project Area was carried out to make observation of the following matters.

- The proposed site for the new pumping station
- The access roads for the new pumping station
- Historical pagodas, artistic architectures in the Project Area
- Major fishing ponds, ponds and wells for domestic water
- Eroded land in the hillsides

(2) Data collection

1) Phase I Study

Relevant data were collected from the agencies concerned. The items of collection of data and information are as follows :

National scale

① Organization and function of environmental administration
② Law, regulations, and guideline concerning environmental matters
③ International convention on environmental conservation
④ Endangered species of fauna and flora
⑤ Particularly protected areas as national parks and nature reserves

⑥ Examples of environmental impact assessment and environmental conservation

Local scale (the Study Area)

⑦ Cultural properties and archaeological sites of historical importance
⑧ Water right and fishing right
⑨ Areas inhabited by ethnic minorities
⑩ Important landscape or scenery for tourism or religion
⑪ Existing water quality data
⑫ Land use and soil
⑬ Other information concerning environmental matters

2) Phase Ⅱ Study

Supplemental data were collected from the agencies concerned. The items of collection of data and information are as follows :

National scale

① Standards concerning environmental protection for cultivated land
② General method of compensation in the project implemented by the Ministry of water resources
③ Capability of laboratory for testing soil and water quality concerning toxin of agrochemicals

(3) Review of the Initial Environmental Examination (IEE)

The IEE made by the S/W mission was reviewed, upon the deliberation with agencies, based upon the results of evaluation on the data and information collected.

This time, according to the guideline of the MoSTE and JICA, the draft IEE was prepared with a separate report for the appraisal of the MWR and the MoSTE.

(4) Environmental Impact Assessment (EIA)

The Environmental Impact Assessment (EIA) was carried out, based upon the results of IEE. The main issues in the EIA are summarized as follows:

1) Environmental impacts associated with change of water management
2) Negative influences associated with local economic activities

3) Environmental impacts associated with construction

(5) Environmental Conservation Program

The Environmental conservation program was recommended, based upon the results of EIA, was divided into 3 stages such as Term of Planning, Term of Construction and Term of Management.

(6) Environmental Evaluation

The Environmental Evaluation was carried out, based upon not only negative impacts but also positive impacts caused by the implementation of this project.

H－2. Major Findings

H-2.1 International Convention on Environmental Conservation & Relevancy to the Study Area

H-2.1.1 International Convention on Environmental Conservation

As of the end of 1993, Viet Nam approved the international environmental conventions as follows:

(1) Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
(2) Convention on Wetlands of International Importance Especially Waterfowl Habitat (Ramsar Convention)
(3) International Convention for the World Heritage
(4) International Union of Conservation of Nature (IUCN)

H-2.1.2 Relevancy to the Study Area

(1) 54 kinds of Mammalia and 60 kinds of birds are registered as endangered species of CITES in Viet Nam, but they do not inhabit in the Study Area and the whole neighborhood.

(2) The wetland of about 1,200ha is located in the mouth of Hong river, and is registered as the specific area of Ramsar Convention. But there is no possibility that the wetland will be influenced by the development of the Study Area, based upon the following reasons:

1) There is no comparison between the discharge of Hong river and the discharge of pumping drainage from the project area in flood season; the discharge of pumping drainage will be very small.
2) Pumping drainage will be controlled by the warning water level
3) In addition to the above reasons, the wetland is located more than 100km from the Project Area.

(3) There is no remains registered as the World Heritage in the Study Area, however there are 74 historical pagodas, 106 artistic architectures, and 13 famous places that are familiar with regional residents.

(4) Endangered species of flora and fauna to Red Data Book of IUCN do not inhabit in the Study Area and the whole neighborhood.

H-2.2 National Park and Forest Reserve

9 National Parks and 87 forest or nature reserves (including National Park) are established and administered by the Ministry of Forestry, and have a gross area of about 1.1 million ha in Viet Nam.

There is no reserve in the Study Area and the whole neighborhood, although there are 2 reserves (Mt. Yen Tu : 3,000ha and Lake Com Son : 15,000ha) in the Ha Bac province. However, there is no possibility that the development of the Study Area will give affect the 2 reserves, because they are located in the eastern and mountain area of the province.

H-2.3 Water Quality

According to the data of station measured recently, the water quality of the Cau river(Dap Cau station) that is one of the main water resources for the Study Area, is within the limits of Provisional Environmental Criteria issued by Ministry of Science, Technology and Environment.

However, it will be essential to continue to monitor water quality of each river around the Study Area, because water quality tends to be affected by the progress of urbanization.

Moreover, it will be advisable to continue to measure and analyze water quality of canals in the Study Area.

For the water quality of river around the Study Area, see Table H-2.3-1 and H-2.3-2.

For the water quality of canals in the Study Area, see Table H-2.3-3.

Table H-2.1.2-1 The Number of Historical Important Site and Pagoda for Tourism and Religion in the Study Area and its Vicinity

unit : place

Area	Category			
	Historical Pagoda	Artsitic Architecture	Famous Place	Total
Ha Bac Province				
Tien Son District	7	33	9	49
Yen Phong District	29	12	3	44
Que Vo District	4	3	-	7
Bac Ninh Town	2	16	1	19
Sub-Total	42	64	13	119
Hanoi Province				
Dong Anh District	16	-	-	16
Gia Lam District	16	42	-	58
Sub-Total	32	42	-	74
Total	74	106	13	193

Source : District office

Table H-2.3-1 Water Quality of River around the Study Area

Parameter	Unit	The Red River (Hanoi Station)		The Duong River (Thuong Cat Station)	
		Range	Mean	Range	Mean
Discharge	m^3/S	448 ~ 11,900	2,665	98 ~ 4,450	920
Temperature	℃	4.8 ~ 30.2	24.1	15.0 ~ 31.2	24.3
pH		6.0 ~ 8.3	7.2	6.4 ~ 8.5	7.4
Iron Total	mg/l	0.04 ~ 1.40	0.20	0.04 ~ 3.2	0.31
Sio_2	mg/l	2.0 ~ 28.0	13.3	2.0 ~ 48.0	16.8
Ca	mg/l	0.775 ~ 1.851	1.34	0.418 ~ 1.976	1.27
Mg	mg/l	0.080 ~ 1.183	0.52	0.120 ~ 1.292	0.56
Na + K	mg/l	0.512 ~ 0.758	0.40	0.044 ~ 1.269	0.42
Hcl_3^-	mg/l	1.400 ~ 2.500	2.08	1.600 ~ 3.300	2.08
So_4^{--}	mg/l	0.020 ~ 1.124	0.19	0.210 ~ 0.618	0.15
cl^-	mg/l	0.010 ~ 0.240	0.09	0.100 ~ 1.720	0.12
Ion Total	mg/l	3.130 ~ 5.820	4.51	3.364 ~ 6.856	4.51
Alkali Total	mg/l	1.40 ~ 2.50	2.0	1.60 ~ 3.30	2.08
Hardness Total	mg/l	1.24 ~ 2.48	1.80	0.87 ~ 2.84	1.82

Source : WRPM

Note : observation term Hanoi Station 1980 ~1991
Thuong Cat Station 1980 ~1990

Table H-2.3-2

Water Quality of the Cau River (Dap Cau Station) in Dry Season

Parameter	Unit	December	January	February	March	April
		1988	1982	1981～82	1982	1982
Temperature	℃	-	18.0	16.3	23.2	24.8
pH		7.9	7.0	7.2	7.4	6.8
Iron Total	mg/l	0.2	0.24	0.08	0.08	0.2
Sio_2	mg/l	25.7	12	22	32	12
Ca	mg/l	1.584	1.386	1.195	1.14	0.95
Mg	mg/l	0.428	0.672	0.538	0.684	0.494
Na + K	mg/l	0.575	0.271	0.329	0.582	0.224
Hcl_3^-	mg/l	2.1	1.9	1.725	2.1	1.4
So_4^{--}	mg/l	0.187	0.292	0.301	0.166	0.128
cl^-	mg/l	0.3	0.14	0.635	0.14	0.14
Ion Total	mg/l	5.174	4.664	3.64	4.81	3.34
Alkali Total	mg/l	2.17	1.9	1.73	2.1	1.4
Hardness Total	mg/l	2.01	2.06	1.74	1.82	1.44

Source : WRPM

Note : Values are average

Table H-2.3-3 Water Quality of Canals in the Study Area

parameters	unit	date: May 31, 1994			date: August 22, 1994		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
pH		8.0	8.0	7.5	8.0	8.0	7.5
Ammonium NH_4^+	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrite No_2^-	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron total	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium Cr^{6+}	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cupper Cu	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc Zn	mg/l	<2	2.0	2.0	<2	<2	<2
Clonine cl	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DO	mg/l	-	-	-	5.3	5.5	5.1
COD	mg/l	20	20	60	30	20	30
Cyanide	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Hydrogen Sulfide	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel Ni	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Source : WRPM

Note : Measuring by handy water inspection set

Sampling No. 1 Cai Canal, Dinh Bang Village

Sampling No. 2 Tram Bridge, Tao khe creek

Sampling No. 3 Kim Doi pumping station, Kim Doi Creek

H-2.4 Soils and Land Use

Present land use in the Study Area is as follows:

(1) Total land area is about 40,000ha, and almost 80% (about 31,000ha) of the area is used as agricultural land.
(2) The remaining 20% (about 9,000ha) of the area is used as residential area.

Almost all soils in the agricultural land are alluvial soils originated from the Hong River, the Thai Binh River and their tributaries. The remaining soils are mainly erosive soils located on the hills scattered in the Study Area.

H-2.4.1 Permanently Flooded Alluvial Soils and Land Use

Permanently Flooded Alluvial Soils is a kind of alluvial soils, and has following troublesome characters which are caused by solarization (e.g. reformation into well-drained paddy field).

(1) The soil produces much Fe^{2+} which prevents paddy-field rice from nutrient uptake and injures it.
(2) The soil assumes high acidity, and has low fertility, especially poor in phosphorus (P).
(3) The soil turns to hardpan affecting plowing in the field after solarization because of its heavy texture.
(4) The conditions mentioned above induce a low productivity of the soil of the area concerned.

Therefore the area where the Permanently Flooded Alluvial Soils is distributed in, is used as paddy field all the year round, and is apt to be affected with waterlogging.

H-2.4.2 Soils on Hills and Damage by Erosion

Erosion has occurred in the hillsides scattered in the study area. The height of these hills range from 40m to 70m above sea level.

The erosion may cause damages as follows:

(1) Eroded bare ground causes an increase of flood discharge.

(2) Arable lands and canals are buried and damaged by soils eroded.

(3) Fe^{2+} flows from the eroded soils (Reddish Yellow Soils and Eroded Skeletal Soils), and prevents paddy-field rice from nutrient uptake and injures it.

For soil and land use, see Appendix C

H-2.5 Present Agrochemicals Use

Intensive agriculture in high cropping intensity has been already done in some areas of western part of the Study Area, where are comparatively well-drained.

The application of agrochemicals is apt to increase rapidly in such an intensive agricultural area.

For further details of agrochemicals use in the Study Area, see Appendix D

In this study, the soil and the water quality in the cultivated land of the Study Area were tested to analyze the remaining pesticide. The measured value of them were within the limits of the criteria established by the Plant Protection Department Center of Pesticide Control of Viet Nam.

For the results of test, see Reference Datum H-2.5-1.

H-2.6 Inland Fishery

The water superficies used in aquiculture in the Study Area is 1,269ha in total, on condition that the production activities of aquiculture are not systematized. Water surfaces for fishery breeding in the area consist of ponds, swamps, small lakes, and paddy fields.

For further details of inland fishery, see Appendix D.

PLANT PROTECTION DEPARTMENT
CENTRE OF PESTICIDE CONTROL

SOCIALIST REPUBLIC OF VIETNAM

No: /CPC-PR

CERTIFICATE ON PESTICIDE RESIDUE

Commodity: Soil and Water
Name of customer:Akira Takubo
Address:Taiyo Consultants Co.,Ltd

RESULTS

Commodity	Mark	Pesticide	Pesticide residue level (mg/kg)	Method for determination
1- Water 1	1	Wofatox	0.007	Gas chromatography
		Kitazin	<0.002 ndc	
		Padan	<0.002 ndc	---
		Validacin	<0.02 ndc	---
2-Water 2	2	Wofatox	0.004	---
		Kitazin	<0.002 ndc	---
		Padan	<0.002 ndc	---
		Validacin	<0.02 ndc	---
3-Soil 3	3	Wofatox	0.003	---
		Kitazin	<0.002 ndc	---
		Padan	<0.002 ndc	---
		Validacin	<0.02 ndc	---
4-Soil 4	4	Wofatox	0.003	---
		Kitazin	<0.002 ndc	---
		Padan	<0.002 ndc	---
		Validacin	<0.02 ndc	---

Remark : sampling Water 1 : Small canal, Dinh Bang Village
sampling Water 2 : Small canal, Van chung Village in Tan Chi Commune
sampling Soil 3 : Cultivated land, Van chung Village in Tan Chi Commune
sampling Soil 4 : Cultivated land, Dinh Bang Village

Conclusion:

-ndc:Not detectable under the given circumstances.

-Limit of detection of Wofatox,Kitazin,Padan is 0.002 mg/kg.

-Limit of detection of Validacin is 0.02 mg/kg.

Hanoi,date 26th September 1994

Pesticide residue division

Chief

Center of pesticide control

Director

H-2.7 Progress of urbanization

Rapid phenomena of urbanization have come out in the study area and the whole neighborhood because capital Hanoi City is very near, are especially remarkable along the National Road Route 1A and around Bac Ninh Town, that have many shops and small scale industrial areas. Moreover progress of urbanization is coming out along the National Road Route 18 and the Provincial Road Route 20, 38, and 280 which are branch lines of the National Road Route 1A.

Progress of urbanization and local economic activities may induce negative influences on environment such as an increase of domestic waste water and waste of every kind.

H-2.8 Public Health

Each district has health-sanitary department and a general hospital, and most of xa have sanitary office of clinic type. Dispute of such facilities, catching rate of trachoma, diarrhea, diseases of digestive organs are rather high, and it is assumed that domestic water including drinking water is main reason.

Most of villages in the Study Area are depending their domestic water, including drinking water, to groundwater mainly.

Recently, contamination of groundwater because of urbanization induces that the method of water supply in villages is changing from well into rain-fed. Such change is especially remarkable in some areas of western part of the Study Area.

Table H-2.8-1 Water quality of shallow well in the study area

Parameter	Unit	No1 Well	No2 Well
COD	mg/l	10	25
Coliform	No/ml	11	15
Bacteria	No/ml	110	150

Source : WRPM

Note : Measuring by handy water inspection set
No1 Well : A shallow well in Van chung Village in Tan Chi Commune
No2 Well : A shallow well in Dinh Bang Village

H－3. Environmental Administration and Procedure of Approval for IEE & EIA

H-3.1 Environmental Administration

The State Committee for Science (SCS) was raised to the status of Ministry of Science, and Technology and Environment (MoSTE) in 1992. Nowadays, the MoSTE has the administrative function concerning environment in addition to the functions such as regulation of industrial property rights, standardization of metrology, quality control, and promotion of science & technology, and has a function to make some pertinent suggestions regarding technical and/or environmental matters in agricultural project (including ODA project).

The organization chart of the MoSTE is illustrated as Figure H-3.1-1.

Practical matters concerning EIA are administered by the EIA & Environmental Technologies Division of the National Environment Agency (NEA) which belongs to the MoSTE.

The organization chart of the NEA is illustrated as Figure H-3.1-2.

Moreover, National Parks and forest or nature reserves are administered by the Ministry of Forestry to control development in forest area.

H-3.2 Procedure of Approval for IEE & EIA

Viet Nam has recently developed a wide range of legislation and ordinances focused on environment and related matters. The significance of this legislation is that irrespective of the grade of environmental impact, environmental assessment has to be carried out on all new project.

The project which is implemented by the Ministry of Water Resources, ought to be administered by the MoSTE (and the Dept. of Science, Technologies & Environment of the provincial government) regarding the preparation of the environmental study such as the IEE, the EIA. Therefore, construction begins after the approval by the MoSTE in regard to the IEE and the EIA.

The procedure of approval for the IEE & EIA for this project is shown as Table H-3.2-1.

Moreover, as of the end of May, 1994, the major laws and ordinances regarding the preparation of the environmental study are the following:

1) Law on Environmental Protection, passed by the National Assembly of the Socialist Republic of Viet Nam, December 27, 1993
2) Provisional Environmental Criteria, published by the MoST, February, 1993
3) Guideline for IEE in Viet Nam, issued by the MoST, September 10, 1993

Basically the details of examination for the prepared IEE are provided by the Guideline for IEE . The main contents of the Guideline for IEE are as follows :

1) Introduction (objectives of evaluation, project description, etc.)
2) Data on actual environmental conditions (regarding each natural factor)
3) Evaluation of environmental impacts during the period of project implementaion (air, water, noise, soil, ecology, waste solid substance, historical, infrastructure, transportation, health care, etc.)
4) Conclusion and recommendation

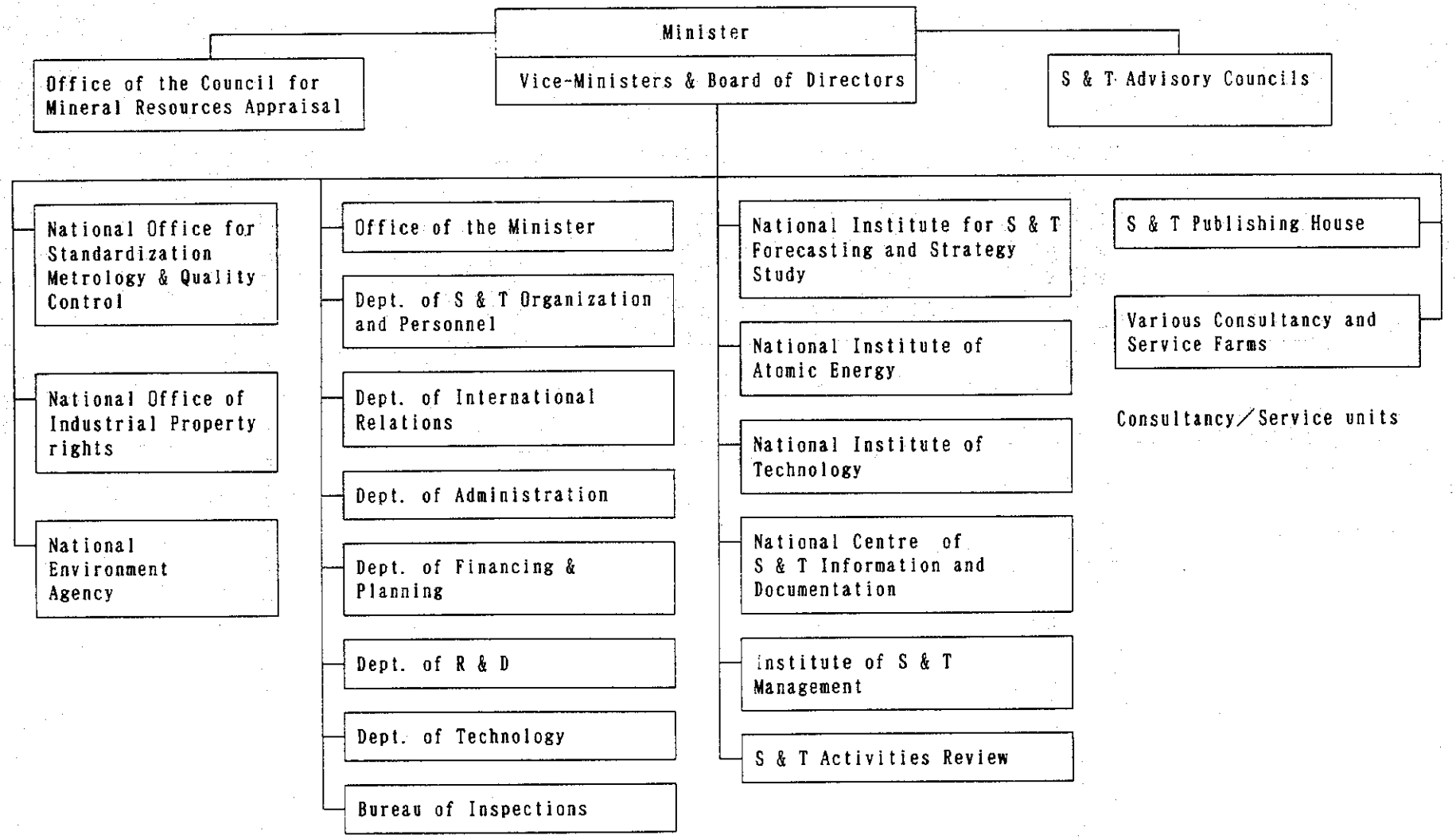

Figure H-3.1-1 Organization Chart of Ministry of Science, Technology and Environment (MoSTE)

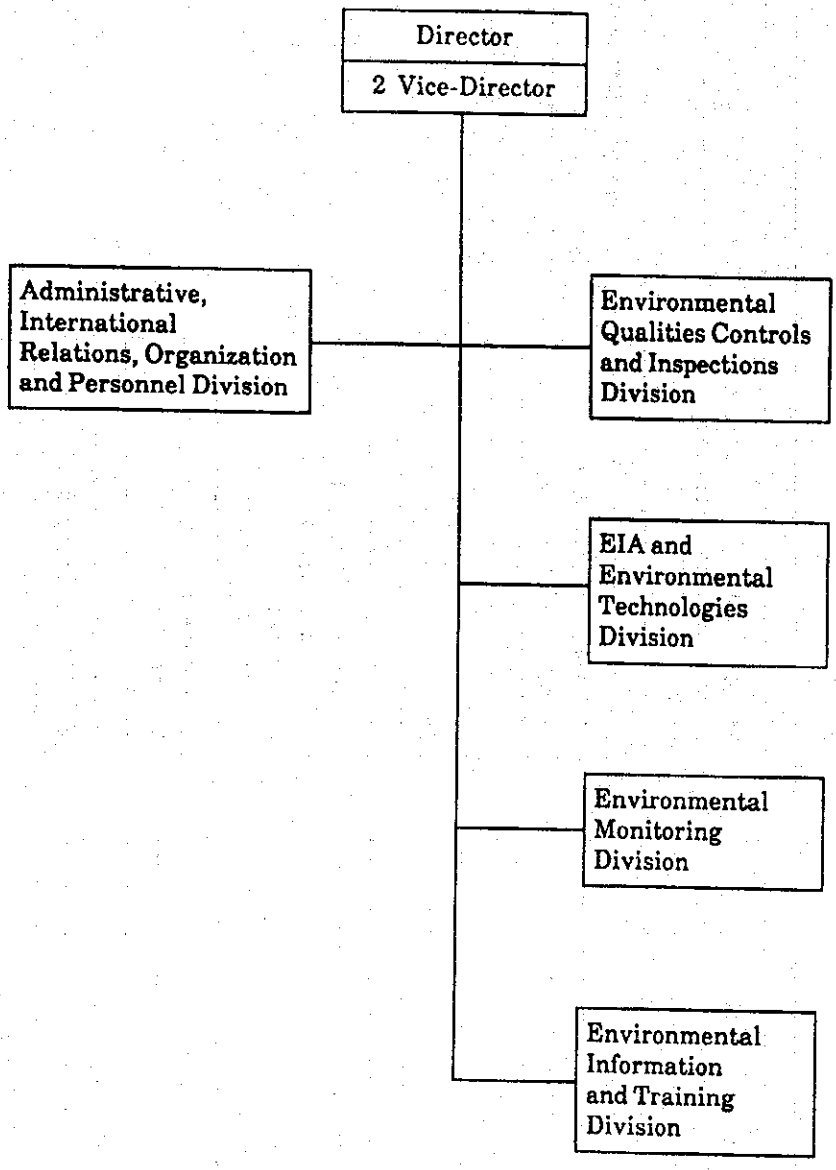

Figure H-3.1-2 Organization Chart of National Environmental Agency

Table H-3.2-1 Procedure of Approval for IEE & EIA on This Project

Term	IEE				EIA			
	Executing Agencies (Preparing Agencies)	Approving Agencies			Executing Agencies (Preparing Agencies)	Approving Agencies		
		Local	MWR	MOSTE		Local	MWR	MOSTE
- Preparing Study								
- Master Plan Study (Preparing Feasibility Study)	WRPM and JICA	×	×	×				
- Feasibility Study (Detail Design)					WRPM and JICA		×	×
- Construction (Control)							×	
- Management (Monitoring)						×	×	×

Notes: MWR ; Ministry of Water Resources
MOSTE; Ministry of Sciences, Technology, and Environment
WRPM ; Institute of Water Resources Planning Management
JICA ; Japan International Cooperation Agency

The executing agency in this project is the WRPM. Therefore the WRPM ought to prepare the IEE and EIA report, based upon the result of environmental study made by JICA.

H－4　Initial Environmental Examination (IEE)

In cooperation with the parties concerned, the Initial Environmental examination (IEE) was carried out, along with the contents recommended by the IEE guideline of MoSTE and JICA, based upon the results of evaluation on the data and information collected.

However according to laws and ordinances, officially the Institute of Water Resources Planning and Management (WRPM) which is the executing agency of this project should rearrange and submit the initial environment examination (IEE) Report of this project to concerned agencies, based upon this report made by JICA.

The IEE is given in the following pages.

THE INITIAL ENVIRONMENTAL EXAMINATION
ON
IMPROVEMENT PROJECT OF DRAINAGE SYSTEM
IN
SOUTH BAC DUONG AGRICULTURAL AREA
IN
THE SOCIALIST REPUBLIC OF VIET NAM

DRAFT REPORT

DECEMBER, 1994

CONTENT

I. Intoroduction

South Bac Duong area is located within the Red River delta, which is the most important agricultural land in the country along with Mekon delta, and is of great advantage to farming, being adjacent to the capital city, Hanoi. However, farming in the rainy season is inactive because a large area of farm land is inundated every year by persistent flood which is brought about by unsubstantial agricultural infrastructure, such as deteriorated irrigation and drainage facilities, and high water level of the Red River and other rivers surrounding the area.

The Government of Viet Nam, giving first priority to improve the productivity of agricultural land which lie in the favorable farming conditions and has an important role to supply the capital area, Hanoi city, with food product, requested the Government of Japan to extend the technical assistance for formulation of the improvement project of drainage system in South Bac Duong agricultural area.

This Environmental Analysis and associated Environmental Management Plan (EMP) have been produced in the frame of the project preparation relevant to the improvement project of drainage system in South Bac Duong.

The objective of this analysis is to upgrade the knowledge on all pertinent environmental aspects related to the planned development of South Bac Duong area for the appraisal of the Ministry of Water Resources and the Ministry of Science, Technology and Environment of Viet Nam.

This analysis was carried out by the Study Team of Japan International Cooperation Agency and Viet Nam's experts from the Ministry of Water Resources which is the major implementation agency for this project, in cooperation with a number of experts from other agencies concerned, the Ministry of Agriculture and Food Industry, the State Planning Committee, People's Committee of Ha Bac Province and offices of district and committee under the province.

However according to laws and ordinances, officially the Institute of Water Resources Planning and Management (WRPM) which is the executing agency of this project should rearrange and submit the Initial Environmental Examination (IEE) Report of this project to concerned agencies, based upon this analysis.

This document has been prepared in fulfilment of the requirements of the World Bank's Operational Directive. The Directive defines 3 environmental categories for projects in which Category "A "projects have the highest potential impacts and Category "C "lowest. The principal criterion for this ranking was that they were largely focused on the rehabilitation of existing systems, rather than the construction of new ones. The implication of the "B" ranking of this project is that although a full Environmental Analysis is not required, sufficient environmental analysis is needed to define the important environmental issues and to develop the appropriate mitigation plans. This document presents the results of the environmental analysis.

Ⅱ. Principal Issues

The principal issues which were identified and discussed during the environmental screening and scoping process in this study were as follows:

1. This improvement project will have some components which will impact on the environmental condition, especially the aquatic habitats. However it is recognized that the most severe impact was already caused by the initial construction of this system, in comparison to it, the impact of the proposed works will be relatively minor, the information on this impact system is needed, not so much as to quantify the previous impact, but to understand whether there is any need or justification for mitigative measures that can be easily implemented and may rectify the previous impact.

2. It is recognized that taking environmental influences caused by the change of water management into consideration, the optimal plan and design of the new system ought to be prepared, moreover particularly it is important to consider the ordinary drainage water level, drainage network and irrigation network. The influences which may be caused by the construction without such a consideration, are as follows:

2.1 Occurrence of troublesome characters of soil
2.2 Deterioration of water quality because of water level down
2.3 Influences upon custom of water use
2.4 Deterioration of fertility of farm land because of change of sedimentation
2.5 Influences upon scene of cultural inheritance
Judging from the above, the change of existing ordinary drainage water level and network ought to be minimized and phased out in this project.

3. It is recognized that negative influence of the progress of agricultural development and/or urbanization, may come out in the Study Area.

3.1 The potential for the increase of fertilizer and pesticide use to contaminate surface water and groundwater systems, namely domestic water supplies
3.2 The potential for the increase of domestic waste water and waste of every kind caused by local economic activities to deteriorate water quality and ecosystem

4. In addition to these, it is recognized that there will be impacts caused by construction activities, particularly:

4.1 The disposal of surplus soil from canal alignments
4.2 The disposal of bare land after excavation in borrow pit and/or quarry
4.3 The disposal of construction waste, including the residue from the demolition of existing concrete structures, useless metals, wooden components, spent engine oil, and so on
4.4 The necessity of safety control for the condition of worker's health and the environmental condition, such as waste water, noise, dust, and so on, during the construction term
4.5 the adequate compensation for the land acquisition of facilities

5. It is also recognized that other issues with implications to the long term operation of the project need to be addressed. The most important of these is the issue of the upstream catchment areas and/or surrounding area, Most of which are experiencing rapid degradation. This issue involves large land area, large population, major questions of land use policy, and the management of nationally important natural resources. It is beyond the scope of irrigation and drainage project to provide any means of solutions. Never the less, it is important to recognize the dependance of this project on these upstream catchment areas and/or surrounding area, and to suggest mechanisms which can be used to track the situation, if not to rectify it.

6. It is recognized that this project may give not only the negative impacts mentioned above, but also the positive impacts, especially social impacts such as the improvement of standard living conditions, the improvement of convenience of transportation, the creation of new jobs, and so on, resulting from the progress of local economic activities which will be promoted by the implementation of the project.

Ⅲ. Legal and Regulatory Framework

Viet Nam has recently developed a wide range of legislation and ordinances focused on environment and related matters, such as safety procedures for construction and worker, pesticide use, and so on.

The significance of this legislation is that irrespective of the Operations Directives of the World Bank, environmental assessment has to be carried out on all new projects. There is also a well defined regulatory framework within which mitigative measures can be framed and their implementation will be assured. The major elements of environmental legislation relevant to the irrigation and/or drainage project are the following:

-1 The Law on Environmental Protection, passed by the National Assembly of the Socialist Republic of Viet Nam, December 27, 1993
-2 The Land Law, passed by the National Assembly of the Socialist Republic of Viet Nam, July 4, 1993
-3 The Ordinance for Plant and Quarantine, the Executive Committee of National Assembly of the Socialist Republic of Viet Nam, February 4, 1994
-4 The Ordinance on Aquatic Resources, 1989
-5 The Ordinance for Labour Protection, passed the State Council of the Socialist Republic of Viet Nam, September 19, 1991
-6 The Law on Public Health Care, 1989
-7 The Law on Forest Protection and Development
-8 The Ordinance for Endangered Species of Fauna and Flora
-9 The Ordinance for Protected Area including National Park and Water Reserve
-10 The International Convention for Environmental Conservation as CITES, Ramsar, Biodiversity, Heritage
-11 The Provisional Environmental Criteria, February, 1994
-12 Technical and Safety Procedure for the Operation and Maintenance of Dredger, issued by the Ministry of Water Resources, (14TCTN-45-85) July 13, 1985
-13 The Guideline for EIA issued by the Ministry of Science, Technology and Environment, September 10, 1993

IV. Approach and Methodology

1. This project is classified as belonging to the World Bank Category B, thus the environmental analysis is required for the appraisal of the Ministry of Water Resources and the Ministry of Science, Technology and Environment.

The environmental analysis was carried out based on the following:

1.1 Initial examination of environmental issue by
- Definition of Environmental Impact Category
- Checklist for Screening
- Checklist for Scoping

based on JICA guideline

1.2 Data collection, field survey and investigation, review of available publications and papers

1.3 Data analysis and processing, visit and meeting with concerned agencies, identification of potential environmental impact

1.4 Identification of protection measure and mitigation measure

1.5 Preparation of environmental monitoring system

1.6 Preparation of environmental plan

The study was carried out in the full respect of the prevailing Viet Namese environmental regulations generally formed in accordance with the guidelines issued by the World Bank on the same matters.

Consultations and review meetings with concerned government agencies were regularly held to achieve general consensus on the findings and proposed recommendations.

According to the criteria, The environmental issues which should be considered before the implementation of the project, were prepared. Particular attention was paid to the EMP (Environmental Management Plan), which not only contains proposal for the elimination or mitigation of the negative impacts, but also suggests the organizational and administrative scenario within which remedial actions should be carried out. Moreover the definition of an environmental monitoring program during construction and operation is included in the environmental management plan.

2. Agronomy Reclamation

2.1 Pesticide Use

The meeting was held with the deputy directors of the Plant Protection Department of the Ministry of Agriculture and Food Industries for the specific purpose of reviewing pesticide supply and application policies and to review the progress of the implementation of the Ordinance for Plant Protection and Quarantine. Specific assurances were sought with respect to the implementation of the Ordinance in the Study Area. Moreover discussion were also held with the Provincial Plant Protection Departments about to use the pesticide for agriculture development and environmental impact.

2.2 Fertilizer Use

Policies and practices for the fertilizer use were reviewed with the deputy director of the Extension Department of the Ministry of Agriculture and Food Industries and with the provincial counterpart staff. Moreover, the role of the Soil and Fertilizer Research is to clarify ongoing laboratory and field investigations on appropriate fertilizer use. specific assurances were sought with respect to the application of criteria for fertilizer recommendation based upon "Maximum Economic Efficiency".

2.3 Reclamation and/or Stabilization of Excavated or Disturbed Sites

The procedure that should be followed in the excavation and disposal of soil was reviewed with the engineering design staff of the project. Specific procedures were identified for inclusion in the construction specifications and for processing of the implementation of drainage project to reduce the potential for the erosion off top soil surface and the potential for the deposition onto farmland. In the case of dredged sediments, specific assurance were sought with respect to the locations in which those materials could be safety disposed of.

3. Aquatic Ecosystem

Meetings were carried out with the scientists of the Research Institute for Aquaculture No.1. The Institute belongs to the Ministry of Aquatic Products and is located in the Study Area.

In these meetings, the following issues were discussed:

3.1 Species cultured in ponds and cages, yield of each cage, and so on

3.2 Role of fresh fishery in the Study Area

3.3 Economic value of each fish species in terms of location and season
3.4 Water superficies used in aquaculture in the Study Area
3.5 Catching facilities
3.6 Water resources for fish ponds
3.7 Influences upon fish because of water contamination
3.8 Diseases of fish

4. Public Health

For the review of medical condition in the Study Area, meetings were held with public health agencies.

The purpose of these meetings were as follows:

4.1 To know the organization of existing local public health monitoring system and the service level in the province
4.2 To know the incidence and its trend of each disease in the Study Area
4.3 To understand the procedures for supplying drugs and insecticides, if and when sudden outbreke occurs
4.4 To identify the water supply and the sanitation in the Study Area, in order to understand the potential hazards to the population posed by practices such as the use of human feces as fertilizer: This information was obtained in order to understand the capacity of the public health system to monitor condition.

V. Project Description

1. Objective of Project

South Bac Doung area is located within the Red River delta, and is of great advantage to farming, being adjacent to the Capital Hanoi. However, farming in the rainy season is inactive because a large area of farm land is inundated every year by persistent flood which is brought about by unsubstantial agricultural infrastructure, such as deteriorated irrigation and drainage facilities, and high water level of the Red River and other rivers surrounding the area.

The objective of this project is to improve the infrastructure and to establish the sustainable agriculture, in order to increase the productivity of agricultural land and the stability of farmers economy in the Project Area.

2. Brief Description of Project

2.1 Outline of Project Area

The Study Area is located at a distance of about 30 km in the northeast of the Capital Hanoi city, and covers a polder land area by the Duong River on the south, the Cau River on the northeast and the Ngu Huyen Khe River on the northwest.

The area extends three districts (Yen phong, Tien Son, Que Vo) and one town (Bac Ninh) in Ha Bac province and two districts (Dong Anh, Gia Lam) in Hanoi province and has a gross area of some 40,000ha.

Based upon the alternative study of the master plan for the Study Area, namely the Whole Project Area, the Project Area was selected as the Priority Area which has a gross area of almost 8,400ha in the middle western part of the Study Area.

2.2 Executing Agency and Environmental Agency Concerned

The executing agency of this project is the Ministry of Water Resources, the environmental agencies concerned are the Ministry of Science, Technology & Environment and the Department of Science, Technology & Environment of Provincial Government.

2.3 Major Component and Development Scale of Project

(1) The Whole Project Area (The Study Area)

Main Project Component	Scale of Project	
	Area, etc.	Contents
Rehabilitation of drainage system	39,610 ha	Pump Station No. 20 Main Drainage Canal 109,060 m Secondary Canal 396,100 m
Rehabilitation of irrigation system	23,490 ha	Pump Station No. 22 Main Irrigation Canal 35,100 m Secondary canal 163,349 m
Substantial changes in farming system	Agricultural land about 28,000ha	Introduction of intensive and multiple farming system in order to increase stability of farmers economy

(2) The project area (The Priority Area)

Main Project Component	Scale of Project	
	Area, etc.	Contents
Rehabilitation of drainage system	6,420 ha	Pump Station No. 2 Main Drainage Canal 8,900 m Secondary Canal 30,840 m
Rehabilitation of irrigation system	5,400 ha	Main irrigation Canal 17,520 m Secondary Canal 53,867 m
Substantial changes in farming system	Agricultural land about 5,800ha	Introduction of intensive and maltiple farming system in order to increase stability of farmers economy

3. Site Description

3.1 Present Socio-economic Status of Project Area

The present socio-economic status of the Study Area are as follows:

(1) land ownership and land use

According the Land Law which was enacted in 1993, the right of using land was allocated to each farmhousehold.

The average arable land per capita is small in the Study Area, is from 400 ㎡ in Tien Son district to 720㎡ in Que Vo district.

(2) Economic Activities in and around the Project Area

The study area is an agricultural zone of paddy culture, and there is not any large scale industry. However, traditional craftsmanship such as handmade paper, wooden furniture with nacre carving, wood carving, etc. are still remaining some villages. Moreover there many shops along the National Road Route 1A and around Bac Ninh Town.

(3) Population

The population in the Study Area is about 510,000 person, and the increase rate of population is recently around 2 to 3 % per year.

3.2 Natural Conditions of Area

The natural conditions of the area are as follows:

(1) Climate

The climate in the area belongs to the tropical monsoon zone, consisting of the dry season, November to March, and the wet season, April to October. the climate records at Hanoi meteorological station locates vicinity of the Project Area and also, the records are available for long term from 1960 to 1992.

1) Temperature

Annual Average Monthly Temperature unit: ℃

Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
16.3	17.1	20.0	23.7	27.4	28.8	29.1	28.5	27.5	24.8	21.3	18.0

Remark: Annual average temperature is 23.5 ℃

2) Relative Humidity

Annual Average Monthly Relative Humidity unit:%

Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
81.3	84.2	85.8	86.3	82.5	82.2	81.8	83.9	82.7	81.1	79.0	78.4

Remark: Annual average relative humidity is about 82.4%

3) Wind

The prevalent wind direction in winter season is North-East with average speed of about 2.0m/s. The prevalent wind direction in summer season is South-East with average wind speed of about 1.8m/s. Typhoons and storms occur in the season from July to October. There are about 6.5 typhoons landed in a year, maximum times in 1973 is twelve ones. Annual average monthly wind speed is as follows.

Annual Average Monthly Wind Speed unit:km/hour

Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
6.99	7.99	7.39	7.99	7.88	6.59	6.54	5.49	5.61	6.10	5.91	6.17

4) Rainfall

Annual Average Monthly Rainfall unit:mm

Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
22	27	42	105	174	256	256	287	247	156	72	16

Remark: Annual average rainfall is 1,661mm

5) Sunshine Hour

Annual Average Monthly Sunshine Hour unit:hour

Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2.4	1.7	1.6	2.9	6.1	5.8	6.5	5.7	6.0	5.3	4.6	4.1

Remark: Annual average sunshine hour is 4.4 hour

(2) Topology

The study area is located within the hong river delta, and is polder land area. the land is nearly flat, gently sloping with 1/8,000 to 1/10,000 from the West to the East.

(3) Hydrology and Drainage Condition

A large area of farm land is inundated every year by persistent flood which is caused by high water level of the Hong River and other rivers surrounding the area in the rainy season.

(4) Soils

Almost all soils in the agricultural land are alluvial soils originated from the Hong River and the Thai Binh River.

(5) Vegetation

There are litle natural vegetation in the area. Almost 80% of the total land area is used as agricultural land, and remaining 20% is used as residental area in the Study Area. About 70% of the total land area is used as agricultural land, and remaining almost 30% is used as residental area in the Project Area.

3.3 Environmentally Sensitive Area in Project Site or Vicinity

Environmentally Sensitive Area	Applicable or Not Applicable					
	In Project Area			Vicinity of Project Area		
	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown
I. Area under specific designation						
1. Habitat of fauna and flora listed in CITES	□	■	□	□	■	□
2. Wetland designated under the Ramsar Convension	□	■	□	■	□	□
3. Heritage sites listed in the World Heritage Convension	□	■	□	□	■	□
4. National parks, nature reserves, etc.	□	■	□	■	□	□
5. Other ( )	□	□	□	□	□	□
II. Socio-economically sensitive areas						
6. Areas inhabited by indigenous people, ethnic minorities, nomads, etc.	□	■	□	□	■	□
7. Historical remains, cultural assets, aesthetic sites	■	□	□	■	□	□
8. Area likely to suffer from significant negative economic impact	□	■	□	□	■	□
9. Other ( )	□	□	□	□	□	□
III. Environmentally sensitive natural land						
10. Arid and semi-arid land (including savanna, rangeland, etc.)	□	■	□	□	■	□
11. Tropical rain forests and wildlands	□	■	□	□	■	□
12. Wetlands or peat lands	□	■	□	□	■	□
12-1. Wetlands	□	■	□	□	■	□
12-2. Peat lands	□	■	□	□	■	□
13. Coastal zone	□	■	□	□	■	□
13-1. Mangrove forests	□	■	□	□	■	□
13-2. Coral reefs	□	■	□	□	■	□
14. Mountainous, steep-sloped, erodible or devastated lands	■	□	□	■	□	■
15. Closed water bodies such as lakes, swamps or reservoirs	■	□	□	■	□	□
16. Other	□	□	□	□	□	□

Remark:This checklist is based upon the JICA Guideline for IEE

VI. Existing Environmental Condition

1. International Convention on Environmental Conservation & Relevancy to the Study Area

1.1 International Convention on Environmental Conservation

As of the end of 1993, Viet Nam approved the international environmental conventions as follows:

(1) Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
(2) Convention on Wetlands of International Importance Especially Waterfowl Habitat (Ramsar Convention)
(3) International Convention for the World Heritage
(4) International Union of Conservation of Nature (IUCN)

The relevancy to the Study Area is as follows:

(1) 54 kinds of Mammalia and 60 kinds of birds are registered as endangered species of CITES in Viet Nam, but they do not inhabit in the Study Area and the whole neighborhood.

(2) The wetland of about 1,200ha is located in the mouth of Hong river, and is registered as the specific area of Ramsar Convention. But there is no possibility that the wetland will be influenced by the development of the Study Area, based upon the following reasons:
   1) There is no comparison between the discharge of Hong river and the discharge of pumping drainage from the project area in flood season; the discharge of pumping drainage will be very small.
   2) Pumping drainage will be controlled by the warning water level.
   3) In addition to the above reasons, the wetland is located more than 100km from the Project Area.

(3) There is no remains registered as the World Heritage in the Study Area, however there are 74 historical pagodas, 106 artistic architectures, and 13 famous places that are familiar with regional residents.

(4) Endangered species of flora and fauna to Red Data Book of IUCN do not inhabit in the Study Area and the whole neighborhood.

2. National Park and Forest Reserve

9 National Parks and 87 forest or nature reserves (including National Park) are established and administered by the Ministry of Forestry, and have a gross area of about 1.1 million ha in Viet Nam.

There is no reserve in the Study Area and the whole neighborhood, although there are 2 reserves (Mt. Yen Tu : 3,000ha and Lake Com Son : 15,000ha) in the Ha Bac province. However, there is no possibility that the development of the Study Area will give affect the 2 reserves, because they are located in the eastern and mountain area of the province.

3. Water Quality

According to the data of station measured recently, the water quality of the Cau river(Dap Cau station) that is one of the main water resources for the Study Area, is within the limits of Provisional Environmental Criteria issued by Ministry of Science, Technology and Environment.

However, it will be essential to continue to monitor water quality of each river around the Study Area, because water quality tends to be affected by the progress of urbanization.

Moreover, it will be advisable to continue to measure and analyze water quality of canals in the Study Area.

For the water quality of river around the Study Area, see appendix

4. Soils and Land Use

4.1 Present land use

Present land use is as follows:

(1) The study area (The Whole Project Area)

Total land area is about 40,000ha, and almost 80% (about 31,000ha) of the area is used as agricultural land. And the remaining 20% (about 9,000ha) of the area is used as residential area.

(2) The Project Area (The Priority Area)

Total land area is about 8,500ha, and about 65% (about 5,600ha) of the area is used as agricultural land, and the remaining 35% (about 2,900ha) of the area is used as residential area and forest land. However, the area of forest is small(about 350ha).

4.2 Soils

Almost all soils in the agricultural land are alluvial soils originated from the Red River, the Thai Binh River and their tributaries. The remaining soils are mainly erosive soils located on the hills scattered in the Study Area.

4.3 Permanently Flooded Alluvial Soils and Land Use

Permanently Flooded Alluvial Soils is a kind of alluvial soils, and has following troublesome characters which are caused by solarization (e.g. reformation into well-drained paddy field).

(1) The soil produces much Fe^{2+} which prevents paddy-field rice from nutrient uptake and injures it.
(2) The soil assumes high acidity, and has low fertility, especially poor in phosphorus (P).
(3) The soil turns to hardpan affecting plowing in the field after solarization because of its heavy texture.
(4) The conditions mentioned above induce a low productivity of the soil of the area concerned.

Therefore the area where the Permanently Flooded Alluvial Soils is distributed in, is used as paddy field all the year round, and is apt to be affected with waterlogging.

4.4 Soils on Hills and Damage by Erosion

Erosion has occurred in the hillsides scattered in the study area. The height of these hills range from 40m to 70m above sea level.

The erosion may cause damages as follows:

(1) Eroded bare ground causes an increase of flood discharge.
(2) Arable lands and canals are buried and damaged by soils eroded.
(3) Fe^{2+} flows from the eroded soils (Reddish Yellow Soils and Eroded Skeletal Soils), and prevents paddy-field rice from nutrient uptake and injures it.

5. Present Agrochemicals Use

Intensive agriculture in high cropping intensity has been already done in some areas of western part of the Study Area, where are comparatively well-drained.

The application of agrochemicals is apt to increase rapidly in such an intensive agricultural area.

In this study, the soil and the water quality in the cultivated land of the Study Area were tested to analyze the remaining pesticide. The measured value of them were within the limits of the criteria established by the Plant Protection Department Center of Pesticide Control of Viet Nam.

For the results of test, see Appendix

6. Inland Fishery (aquatic ecosystem)

The water superficies used in aquiculture in the Study Area is 1,269ha in total, on condition that the production activities of aquiculture are not systematized. Water surfaces for fishery breeding in the area consist of ponds, swamps, small lakes, and paddy fields.

Fish species observed in the area are mainly fed by microbiologies organic materials under emulsion from of aquatic vegetal low and high classes, and plankton or small aqua-living beings. The most popular species are silver carp -hypopthamichthys harmandy(Ca Me Trang), bighead carp-aristichys nobilis(Ca Me Hoa), India carp-labeo rohita(Ca Ro Hu), mud carp-cirrhina morigal(Ca Morigal), mud carp-cirrhina molitorella(Ca Troi Ta), tilapia-tilapia mossembica(Ca Ro Phi), grass carp-ctenpharyngodon idellus(Ca Tram Co), snake head-muller(Ca Qua) ,common carp(Ca Chep).

7. Progress of urbanization

Rapid phenomena of urbanization have come out in the study area and the whole neighborhood because capital Hanoi City is very near, are especially remarkable along the National Road Route 1A and around Bac Ninh Town, that have many shops and small scale industrial areas. Moreover progress of urbanization is coming out along the National Road Route 18 and the Provincial Road Route 20, 38, and 280 which are branch lines of the National Road Route 1A.

Progress of urbanization and local economic activities may induce negative influences on environment such as an increase of domestic waste water and waste of every kind.

8. Social Infrastructure

The present situation of main infrastructure are as below:

8.1 Village Water Supply and Sewerage

Most of villages in the study area are depending their domestic water, including drinking water, to groundwater and the ponds around the village area used supplementary. The well is mainly hand dug shallow well, and few deep well are existing in densely populated area such as Bac Ninh. In some villages, concrete ladder type washing places are provided in the pond in order to wash food stuff, kitchen wares, cloths, etc. There is not any hygienic measure such as water quality control or disinfection of water neither for well nor pond, therefore water-carry-diseases will easily be outbroken in the area. most of villages are developed in comparatively high places, therefor the flooding or waterlogging damage to the residential area is very seldom because the pond and paddy field around the village are functioning as retaining basin. There is no sewerage treatment facility in the rural area, and the sewerage is often discharged into hollow around the house.

8.2 Rural Electrification

Most of villages in the study area have been connected with power transmission line, and other then lighting, radio, television, electric fun, etc. are already diffused widely. The electric power is also driving small rice milling unit and other facilities, and contributing for production and leveling up of living conditions.

8.3 Road Transportation

The road networks in the study area is already reached to rather high level quantitatively, and it is considered as sufficient for convenience of daily life. Meanwhile, most of village-to-village roads are narrow and without any pavement, therefore access of motor vehicle is often disturbed after rain fall. The farm roads are almost not more than footpath and without accessibility of motor vehicle. consequently the brought-off of harvested product and/or brought-in or of agri-input are depending on man-power and draft animal.

8.4 Public Health

Each district has health-sanitary department and a general hospital, and most of xa have sanitary office of clinic type. Dispute of such facilities,

catching rate of trachoma, diarrhea, diseases of digestive organs are rather high, and it is assumed that domestic water including drinking water in the above paragraph is main reason. fortunately, the outbreak of cholera and other epidemics are not recorded since 1940s. As a recent tendency, tuberculous is patient are increasing especially younger generation, therefore the sanitary offices are endeavoring to diffuse vaccination for tuberculosis.

Recently, contamination of groundwater because of urbanization induces that the method of water supply in villages is changing from well into rain-fed. Such change is especially remarkable in some areas of western part of the Study Area.

Ⅶ. Environmental Issues

1. Outline

For clarifying environmental issues in the Study Area, based upon the results of evaluation on the data and information collected, environmental analysis was carried out, upon the deliberation with agencies concerned along with the checklist of JICA's guideline.

the analysis was carried out in the following order:

① Definition of environmental impact categories
② Checklist for screening
③ Checklist for scoping
④ Overall evaluation
⑤ Clarifying environmental issues in the study area

2. Definition of Environmental Impact Categories

Social Environment

Categories of Environmental Impact	Definition
(1) Socio-economic issues (1)-1 Social issues	
1. Planned residential settlement	New land settlement implemented in agriculture & rural developmenmt projects such as land clearing & leveling sea/swamp reclamation and irrigation development; exemplified by the estate project approach with settlement scheme for nomad, landless farmersor shifting cultivators
2. Involuntary resettlement	Forced resettlement to move inhabitants away from their original dwelling places in the area that will be submerged as development projects
3. Substantial changes in way of life	Change in the way of life of the affected people, and in particular changes in the role of women in family & society brought by agricultural and rural development
4. Conflict among communities and peoples	Friction due to conflicting interests between beneficiaries and non-beneficiaries, people in favor of and those against development, new settlers and host people, involved in development and outsiders, people in a project area and those affected in the surrounded area
5. Impact on native peoples	Adverse effects of development on local communities composed partly or entirely of indigenous people (including tribal groups), low-caste group, ethnic minorities, or nomads
(1)-2 Demographic issues	
6. Population increase	Significant population increase in a project or surrounding area due to development
7 Drastic change in population composition	Drastic change in population composition in a project or surrounding area due to development
(1)-3 Economic activities	
8 Changes in bases of economic activities	Forced or involuntary relocation of economic bases or means such as farmlands, fishing grounds, etc., under a project due to land acquisition, changes in land use regulation, and deterioration or depletion of bases or means for economic activities
9 Occupational change and loss of job opportunity	Forced or involuntary occupational change due to land acquisition and loss or deterioration of means or bases of economic activities; it includes loss of job opportunities due to farm mechanization
10 Increase in income disparities	Increase in income disparities among groups brought about by development; it implies relative impoverishment of the economically weak

Social Environment (continued)

(1)-4 Institutional and custom related issues		
11	Adjustment & regulation of water or fishing (riparian) rights	Adverse development effects on water or fishing(riparian) rights and necessary adjustments or regulations to rectify the same
12	Changes in social and institutional structures	Changes in social and institutional structures as a result of establishment of new, or modification of existing, rural organizations caused by development
13	Changes in existing institutions and customs	Changes in existing institutions and customs involved in or induced by development activities
(2) Health and sanitary issues		
14	Increased use of agrochemicals	Increased use of chemical pesticides due to intensification of agriculture; introduction of high-yielding varieties & new crops and irrigation development
15	Outbreak of endemic diseases	Spreading of endemic diseases as a result of the adverse effects of development
16	Spreading of endemic diseases	Spreading of endemic diseases attributable to the adverse effects of development
17	Residual toxicity of agrochemicals	Accumulation in the natural environment(soil, water, etc.,) of agrochemicals or chemical substances with high residual toxicity such as organo-chloric insecticides, etc.
18	Increase in domestic and other human wastes	Increase in domestic and other human wastes due to the consequences of development such as population increase
(3) Cultural asset issues		
19	Impairment of historic remains and cultural assets	Direct or indirect impairment or destruction of sites, structures, and remains of archaeological, historical, religious, cultural, or aesthetic value as result of development
20	Damage to aesthetic sites	Direct or indirect negative effects on aesthetic features as a result of development
21	Impairment of buried assets	Impairment or destruction of buried assets due to development activities

Natural Environment

Categories of Environment Impact	Definition
(4) Biological and ecological issues	
22 Changes in vegetation	Direct or indirect deterioration or degradation of vegitation due to development activities including removal of vegitation cover, alteration of land use, encoachment on forest, alteration of environmental conditions, etc.
23 Negative impact on important or indigenous fauna and flora	Adverse effects on important or indigenous animal & plant species due to destruction of or changes in habitats
24 Degradation of ecosystem with biological diversity	Degradation of ecosystem that allows the wild species of plants and animals to withstand external stress
25 Proliferation of exotic and/or hazardous species	Introduction of pathogenic agents or spreading of hazardous species due to creation of environment conductive to their propagation
26 Destruction of wetlands and peatlands	Extinction of wetlands or peatlands due to direct destruction caused by development activities such as large-scale earth filling; or extinction due to indirect effects such as drying and decomposition due to changes in hydrological regime
27 Encroachment into tropical rain forests and wildlands	Decrease or disappearance of tropical rain forests due to direct or indirect effects of development
28 Destruction or degradation of mangrove forests	Disappearance of mangrove forests attributable to direct destruction or deterioration of supporting environmental conditions
29 Degradation of coral reefs	Encroachment due to direct destruction, or damage to and deterioration of the supporting environment caused by sedimentation, etc.
(5) Soil and land resources (5)-1 Soil resources	
30 Soil erosion	Washing or blowing away of soil from the earth surface by the action of water or wind
31 Soil salinization	Phenomena in which soluble salts accumulate in the surface layer of soils and crops growth is consequently affected
32 Deterioration of soil fertility	Deterioration of soil productivity due to leaching and decomposition of nutrients, nutrient absorption by plants, surface soil erosion, salinization, failure in soil management, etc.
33 Soil contamination by agrochemicals and others	Accumulation of agrochemicals in soil with high residual toxicity

Natural Environment (continued)

	(5)-2 Land resources	
34	Devastation or desertification of land	Deterioration of land productivity or desertification caused by artificial or natural impacts
35	Devastation of hinterland	Devastation of area surrounding a project area as a result of secondary or indirect impacts of development
36	Ground subsidence	Settlement of ground caused by the dehydration or drying of wetlands, peat swamp, or reclaimed lands, or excessive exploitation of groundwater
	(6) Hydrology, water quality and air (6)-1 Hydrology	
37	Change in surface water hydrology	Alteration of river discharge or water level as the effects of reservoir construction, irrigation water intake, or drainage
38	Change in ground water hydrology	Changes in the groundwater recharge mechanism or groundwater table caused by infiltration of irrigated water and exploitation of groundwater
39	Inundation and flooding	Overflowing of a river onto the surrounding land or the surrounding of sea water onto the coastal land. Inundation or flooding are caused by increased river or run-off discharge or poor water management
40	Sedimentation	Settlement of transported sediment in river, estuaries and reservoir
41	Riverbed degradation	Degradation of riverbeds in lower basin areas due to in sufficient sediment load to maintain riverbed level
42	Impediment of inland navigation	Adverse impacts on navigation due to development activities
	(6)-2 Water quality and temperature	
43	Water contamination and detrioration of water quality	Deterioration of water quality due to development activities
44	Water eutrophication	Accumulation in water of nutritive soluble salts such as nitrate and phosphate
45	Sea water intrusion	Intrusion of a salt water wedge along a riverbed
46	Change in temperature of water	Adverse impact of low irrigation water temperate on crops
	(6)-3 Atmosphere	
47	Air pollution	Diffusion of agrochemicals and sand dust and odoriferous particles such as exhaust from vehicles and machinery into the air

3. Checklist for Screening

Social Environment

	Categories of Environmental Impact	Evaluation Y	N	Unk	Evaluation Basis
(1) Socio-economic issues Y:yes, N:no, Unk:unknown (1)-1 Social issues					
1	Planned residential settlement	☐	■	☐	No plan in this project
2	Involuntary resettlement	■	☐	☐	Compensation, resettlment problem at the site of improved drainage facilities
3	Substantial changes in way of life	☐	☐	■	Change may happen, but not studied well
4	Conflict among communities and peoples	☐	☐	■	Conflict may occur between upper and down stream area owing to the new drainage system
5	Impact on native peoples	☐	■	☐	No indigenous people, ethnic, minority in the project area
(1)-2 Demographic issues					
6	Population increase	☐	☐	■	Progress of urbanization may cause population increase rather than this development
7	Drastic change in population composition	☐	☐	■	Progress of urbanization may cause the change rather than this development
(1)-3 Economic activities					
8	Changes in bases of economic activities	☐	■	☐	Not expected
9	Occupational change and loss of job opportunity	☐	■	☐	Not expected
10	Increase in income disparities	☐	☐	■	Income increase is expected in the project area, but not studied well
(1)-4 Institutional and custom related issues					
11	Adjustment & regulation of water or fishing (riparian) rights	■	☐	☐	Change of water level of fishing pond may happen according to the new drainage system
12	Changes in social and institutional structures	■	☐	☐	Change of local water management may happen according to the new drainage system
13	Changes in existing institutions and customs	☐	☐	■	Change may happen because of the new water management, detail study is needed
(2) Health and sanitary issues					
14	Increased use of agrochemicals	■	☐	☐	Slight increase is expected Detail study is needed

Social Environment (continued)

	Categories of Environmental Impact	Evaluation			Evaluation Bases
		Y	N	Unk	
15	Outbreak of endemic diseases	☐	■	☐	Not expected
16	Spreading of endemic diseases	☐	☐	■	Public health condition is unclear Detail study is needed
17	Residual toxicity of agrochemicals	☐	☐	■	Not clearly known Detail study is needed
18	Increase in domestic and other human wastes	■	☐	☐	Waste problem will become serious because of the increase of population & economic activity
(3) Cultural asset issues					
19	Impairment of historic remains and cultural assets	☐	☐	■	Some historic remains in project area, but impact is not clearly known
20	Damage to aesthetic sites	☐	■	☐	Not expected because of only rehabilitation plan
21	Impairment of buried assets	☐	■	☐	Not expected

Natural Environment

	Categories of Environmental Impact	Evaluation			Evaluation Bases
		Y	N	Unk	
(4) Biological and ecological issues					
22	Changes in vegetation	☐	☐	■	Slight change may happen because of change of water level and quality
23	Negative impacts on important or indigenous fauna and flora	☐	■	☐	No important or indigenous fauna and flora in the project area and vicinity
24	Degradation of ecosystem with biological diversity	☐	☐	■	Slight change may happen, but not studied well
25	Proliferation of exotic and/or hazardous species	☐	■	☐	Not expected
26	Destruction of wetlands and peatlands	☐	■	☐	No important wetland in the project area a and vicinity
27	Encroachment into tropical rain forests and wildlands	☐	■	☐	No tropical rain forest and wildland in the project area and vicinity
28	Destruction or degeneration of mangrove forests	☐	■	☐	No mangrove forest in the project area and vicinity

Natural Environment (continued)

	Categories of Environmental Impact	Evaluation Y	Evaluation N	Evaluation Unk	Evaluation Bases
29	Degradation of coral reefs	☐	■	☐	No coral reef in the project area and vicinity
	(5) Soil and land resources (5)-1 Soil resources				
30	Soil erosion	■	☐	☐	Erosion has occurred in the hillsides in the project area
31	Soil salinization	☐	■	☐	Not expected because of wet climate
32	Deterioration of soil fertility	■	☐	☐	Deterioration is expected because of progress of intensive agriculture
33	Soil contamination by agrochemicals and others	☐	☐	■	Not expected because of low dosage of agrochemicals, but existing condition is not clearly known
	(5)-2 Land resources				
34	Devastation or desertification of land	☐	■	☐	Not expected
35	Devastation of hinterland	☐	■	☐	Not expected
36	Ground subsidence	☐	■	☐	Not expected
	(6) Hydrology, water quality and air (6)-1 Hydrology				
37	Changes in surface water hydrology	■	☐	☐	Change may happen because of the new drainage system, depending on the new plan
38	Change in groundwater hydrology	☐	■	☐	Change may not happen because water level of canals will be kept as before in dry season
39	Inundation and flooding	☐	■	☐	Not expected because of the new drainage plan
40	Sedimentation	■	☐	☐	Change may happen because the new drainage and irrigation system may cause new sedimentation phenomena
41	Riverbed degradation	☐	■	☐	Not expected
42	Impediment of inland navigation	☐	■	☐	Not expected
	(6)-2 Water quality and temperature				
43	Water contamination and deterioration of water quality	■	☐	☐	Phenomena may happen because of water level change and increase of economic activity

Natural Environment (continued)

	Categories of Environmental Impact	Evaluation Y	N	Unk	Evaluation Bases
44	Water eutrophication	■	□	□	Possible impact because of deterioration of water quality and failure in water management
45	Sea water intrusion	□	■	□	Not expected
46	Change in temperature of water	□	■	□	Not expected
	(6)-3 Atmosphere				
47	Air pollution	□	■	□	Not expected

Overall Evaluation (Necessity of EIA)	■	□	□	

4. Checklist for Scoping

1) Applicable development activities
: Irrigation, Drainage, ~~Land clearing & leveling, Sea/swamp reclamation, Land consolidation, New land settlement, Dam and reservoir~~, Substantial change in farming system

2) Applicable development type
: ~~New project~~, rehabilitation

3) Applicable environmental sensitive area
: ~~Arid and semi-arid lands, Tropical rain forests, wildlands, Wetlands, Peatlands, Coastal zones, Mangrove forests, Coral reefs, Mountainous/steep-sloped/erodible/devastedlands~~, Closed water bodies in upstream or downstream

(Irrelevant items in the above are deleted)

Social Environment

	Categories of Environmental Impact	Evaluation A	B	C	D	Evaluation Basis
1	Planned residential settlement	☐	☐	☐	■	No plan in this project
2	Involuntary resettlement	☐	■	☐	☐	Compensation, resettlement problem at the site of improved drainage facilities
3	Substaintial changes in way of life	☐	☐	■	☐	Change may happen but not studied well
4	Conflict among communities and peoples	☐	☐	■	☐	Conflict may occur between upper and down stream drainage area
5	Impact on native peoples	☐	☐	☐	■	No indigenous people, ethnic, minority in the project area
6	Population increase	☐	☐	■	☐	Urbanization may cause population increase rather than this development
7	Drastic change in population composition	☐	☐	■	☐	Urbanization may cause the change rather than this development
8	Changes in bases of economic activities	☐	☐	☐	■	Not expected
9	Ocupational change and loss of job oppotunity	☐	☐	☐	■	Not expected
10	Increase in income disparities	☐	☐	■	☐	Income increase is expected in the rehabilitated drainage area
11	Adjustment & regulation of water or fishing (riparian) rights	☐	■	☐	☐	Change of water level of fishing pond may happen by the new drainage system
12	Changes in social and institutional structures	☐	■	☐	☐	Change of local water management may happen according to new drainage system
13	Changes in existing institutions and customs	☐	☐	■	☐	Change may happen because of the new water management, detail study is needed

Social Environment (continued)

	Categories of Environmental Impact	Evaluation				Evaluation Basis
		A	B	C	D	
14	Increased use of agrichemicals	□	■	□	□	Slight increase is expected Detail study is needed
15	Outbreak of endemic diseases	□	□	□	■	Not expected
16	Spreading of endemic diseases	□	□	■	□	Study on public health condition is needed
17	Residual toxicity of agrochemicals	□	□	■	□	Not clearly known Detail study is needed
18	Increase in domestic and other human wastes	□	■	□	□	Waste problem will become serious because of increase of economic activity
19	Impairment of historic remains and cultural assets	□	□	■	□	Impact for historic remains may happen but not studied well
20	Damage to aesthetic sites	□	□	□	■	Not expected because of only rehabilitation plan
21	Impairment of buried assets	□	□	□	■	Not expected

Natural Environment

	Categories of Environmental Impact	Evaluation				Evaluation Bases
		A	B	C	D	
22	Changes in vegitation	□	□	■	□	Slight change may happen because of change of water level and quality
23	Negative impacts on important or indigenous fauna and flora	□	□	□	■	No important or indigenous fauna and flora
24	Degradation of ecosystems with biological diversity	□	□	■	□	Slight change may happen Detail study is needed
25	Proliferation of exotic and/or hazardous species	□	□	□	■	Not expected
26	Destruction of wetlands and peatlands	□	□	□	■	No important wetland
27	Encroachment into tropical rain forests and wildlands	□	□	□	■	No tropical rain forest and wildland
28	Destruction or degeneration of mangrove forests	□	□	□	■	No mangrove forest

Natural Environment (continued)

	Categories of Environmental Impact	Evaluation				Evaluation Basis
		A	B	C	D	
29	Degradation of coral reefs	□	□	□	■	No coral reef
30	Soil erosion	□	■	□	□	Erosion has occurred in the hillsides in the project area
31	Soil salinization	□	□	□	■	Not expected because of wet climate
32	Deterioration of soil fertility	□	■	□	□	Deterioration is expected because of progress of intensive agriculture
33	Soil contamination by agrochemicals and others	□	□	■	□	Not expected because of low dosage of agrochemicals, but existing condition is not clearly known
34	Devastation or desertification of land	□	□	□	■	Not expected
35	Devastation of hinterland	□	□	□	■	Not expected
36	Ground subsidence	□	□	□	■	Not expected
37	Changes in surface water hydrology	□	■	□	□	Change may happen because of the new drainage system
38	Changes in groundwater hydrology	□	□	□	■	change may not happen because water level of canals will be kept as before in dry season
39	Inundation and flooding	□	□	□	■	Not expected because of new drainage plan
40	Sedimentation	□	■	□	□	The new drainage and irrigation system may cause new sedimentation phenomena
41	Riverbed degradation	□	□	□	■	Not expected
42	Impediment of inland navigation	□	□	□	■	Not expected
43	Water contamination and deterioration of water quality	□	■	□	□	Because of water level change and increase of economic activity
44	Water eutrophication	□	■	□	□	Because of deterioration of water quality and failure in water management
45	Sea water intrusion	□	□	□	■	Not expected
46	Changes in temperature of water	□	□	□	■	Not expected

Natural Environment (continued)

Categories of Environmental Impact	Evaluation				Evaluation Basis
	A	B	C	D	
47 Air pollution	□	□	□	■	Not expected

1/ Applicable columns with the following impact degree are marked with ■
(SEI : Significant Environmental Impact)
A : The subject SEI is unquestionably induced by the Project
B : The subject SEI is likely to be induced by the Project
C : The SEI is not fully known
D : There is no possibility of the subject SEI being induced by the Project

2/ Potential impact, etc., are filled in referring to "Significant Environment Impact and Issues"

5. Overall Evaluation

Social Environment

	Categories of Environmental Impact	Overall Evaluation	Necessary Study Items
2	Involuntary resettlement	B	Compensation and resettlement study according to the new drainage and irrigation plan
11	Adjustment & regulation of water or fishing(riparian)rights	B	Estimation of change of fishing pond water level according to the new drainage system
12	Changes in social and instuitutional structures	B	Study of new institutional structure according to the new drainage water management
14	Increased use of agrochemicals	B	Estimation of use of agrochemicals in the new cropping system, preparing guideline for use
18	Increase in domestic and other human wastes	B	Estimation of waste increase and study of mitigation method
3	Substaintial changes in way of life	C	Estimation of positive and negative change i n the project area
4	Conflict among communities and people	C	Establishment of optimal new drainage system for the entire area (about40,000ha)
6	Population increase	C	Estimation of population increase in the project area and vicinity
7	Drastic change in population composition	C	Estimation of population composition increase in the project area and vicinity
10	Increase in income disparities	C	Estimation of income increase in the project area
13	Changes in existing institutions	C	Establishment of new institutions based upon the new drainage system
16	Spreading of endemic diseases	C	study concerning improvement of public health in communities
17	Residual toxicity of agrochemicals	C	Study concerning enlightenment of agrochemicals use and its guideline
19	Impairment of historic remains and cultural assets	C	Estimation of impact on structures by the new development plan

(SEI : Significant Environmental Impact)
A : The subject SEI is unquestionably induced by the Project
B : The subject SEI is likely to be induced by the Project
C : The SEI is not fully known
D : There is no possibility of the subject SEI being induced by the Project

Natural Environment

	Categories of Environmental Impact	Overall Evaluation	Necessary Study Items
30	Soil erosion	B	Study concerning soil conservation in the hillsides scattered in the project area
32	Deterioration of soil fertility	B	Study concerning conservation of soil fertility
37	Changes in surface water hydrology	B	Forecast of surface water hydrology in dry and rainy season
40	Sedimentation	B	Estimation of sedimentation based on the new irrigation and drainage system
43	Water contamination and detrioration of water quality	B	Monitoring water quality, enlightenment of agrochemicals use, and waste water disposal
44	Water eutrophication	B	Study concerning closed water bodies and waste water disposal
22	Changes in vegitation	C	Literature study and interviewing related office
24	Degradation of ecosystems with biological diversity	C	Literature study and interviewing related office
33	Soil contamination by agrochemicals and others	C	Study concerning enlightenment of agrochemicals use and its guideline

(SEI : Significant Environmental Impact)

A : The subject SEI is unquestionably induced by the Project

B : The subject SEI is likely to be induced by the Project

C : The SEI is not fully known

D : There is no possibility of the subject SEI being induced by the Project

6. Environmental Issues

The environmental issues were clarified through the environmental screening and scoping process in this study, were as follows:

6.1 This improvement project will have some components that will impact on the environmental condition, especially the aquatic habitats. However it is recognized that the most severe impact was already caused by the initial construction of this system. in comparison to it, the impact of the proposed works will be relatively minor, the information on this impact system is needed, not so much as to quantify the previous impact, but to understand whether there is any need or justification for mitigative measures that can be easily implemented and may rectify the previous impact.

6.2 It is recognized that taking environmental influences caused by the change of water management into consideration, the optimal plan and design of the new system ought to be prepared, moreover particularly it is important to consider the ordinary drainage water level, drainage network and irrigation network. The influences which may be caused by the construction without such a consideration, are as follows:

1) Occurrence of troublesome characters of soil
2) Deterioration of water quality because of water level down
3) Influences upon custom of water use
4) Deterioration of fertility of farm land because of change of sedimentation
5) Influences upon scene of cultural inheritance

From the viewpoint of large size machinery workability and rotational cropping, lowering water level of drainage canal, that is changed by down of drainage canal bed and pumping drainage in the term of ordinary drainage, is desirable for the non-irrigation period or upland cropping.

However, judging from the above, the change of existing ordinary drainage water level and network ought to be minimized and phased out in this project.

6.3 It is recognized that the progress of agricultural development and/or urbanization may cause not only positive influences but also negative influences in the Study Area. the negative influences are as follows:

1) The potential for the increase of fertilizer and pesticide use to contaminate surface water and groundwater systems, namely domestic water

supplies

2) The potential for the progress of intensive agriculture to deteriorate soil fertility

3) The potential for the increase of domestic waste water and waste of every kind caused by local economic activities to deteriorate water quality and ecosystem

6.4 In addition to these, it is recognized that there will be impacts caused by construction activities, particularly:

1) The possibility of influences on downstream area and/or downstream canal associated with the operation of new pumping station

2) The possibility of influences on residential environment associated with the establishment of new pumping station

3) The disposal of surplus soil from canal alignments

4) The disposal of bare land after excavation in borrow pit and/or quarry

5) The disposal of construction waste, including the residue from the demolition of existing concrete structures, useless metals, wooden components, spent engine oil, and so on

6) The necessity of safety control for the condition of worker's health and the environmental condition, such as waste water, noise, dust, and so on, during the construction term

7) the adequate compensation for the land acquisition of facilities

6.5 It is also recognized that other issues with implications to the long term operation of the project need to be addressed. The most important of these is the issue of the upstream catchment areas and/or surrounding area, Most of which are experiencing rapid degradation. This issue involves large land area, large population, major questions of land use policy, and the management of nationally important natural resources. It is beyond the scope of irrigation and drainage project to provide any means of solutions. Never the less, it is important to recognize the dependance of this project on these upstream catchment areas and/or surrounding area, and to suggest mechanisms which can be used to track the situation, if not to rectify it.

6.7 It is recognized that this project may give not only the negative impacts mentioned above, but also the positive impacts, which are divided 2 categories, direct effects and indirect effects.

1) Direct effects generated from the project implementation are as follows:
- Increase of agricultural production and/or inland fishery production
- Benefit effects reduced by improvement of irrigation and drainage system

In consequence, farmer's income will be increasing and be stabilized.

Usually, such effects are countable as benefits, and are used as parameters of the economic evaluation of the project.

2) While indirect effects, namely social effects generated from the project implementaion, are usually uncountable as benefits.

Resulting from the project implementation, the indirect effects will be come out as follows:
- Improvement of residential environmental condition in rainy season
- In relation to this, improvement of public health condition
- Improvement of convenience of transportation
- Increase of employment chance through construction of this project and the progress of intensive agriculture

Moreover resulting from the progress of local economic activities promoted by the project implementation, the indirect effects will be come out in the Project Area as follows:
- Improvement of standard living conditions
- Creation of new jobs
- In relation to this, increase of employment chance

The environmental impact assessment (EIA) ought to be prepared in the detail design stage according to the issues mentioned above, especially paragraph from 6.2 to 6.4.

Ⅷ. Mitigation Plan

Based upon the discussion of the environmental issues, mitigation plan was proposed in this chapter. however, since there is room for further investigation, the final mitigation plan ought to be prepared as a link in the chain of EIA in the detail design stage.

1. Mitigation Measure for Environmental Impact Associated withe Change of Water Management

Assuming that the existing water management is changed without consideration, there is possibility that environmental impacts upon every aspects may come out as follows:

- Occurrence of troublesome characters of soil because of water level down
- Deterioration of water quality because of water level down
- Influence upon custom of water use
- Change of sedimentation
- Influence upon scene of cultural inheritance

The effective countermeasures for these impacts are as follows:

1.1 The change of the existing water management such as setting ordinary drainage water level, drainage network, irrigation network, ought to be minimized and phased out.

1-2 Moreover taking such a concept and influences on environment into consideration, adequate plan and design ought to be prepared.

1-3 In addition to these, the improvement and strengthening of existing water control and management organization is recommended.

2. Mitigation Measure for Negative Influence Associated with Local Economic Activities

There is possibility that the progress of agricultural development and/or urbanization will cause not only positive influences but also negative influences in the Study Area as follows:

- The potential for increase of agrochemicals use
- The potential for deterioration of soil fertility

- The potential for deterioration of water quality and ecosystem

No specific mitigation measures are required, if agrochemicals use are exact according to the IPM program provided by the Plant Protection Department of the MAFI and/or the standard application rate of fertilizer recommended by the Extention Department of the MAFI. However, The progress of intensive agriculture will tend to induce disorderly agrochemicals use.

Although it may be beyond the scope of this project to provide any means of solutions for influences associated with local economic activities and /or urbanization, it is important to recognized the dependance of this project on the surrounding area and suggest mechanisms which can be used to track the situation, if not to rectify it.

Therefore, there is a need to prepare the countermeasures as follows:

2.1 For preventing excess use of agrochemicals, the propagation and enlightenment scheme of proper agrochemicals use (including conservation of soil fertility) ought to be prepared by organization of research and extension.

2.2 For checking on the deterioration of environmental conditions caused by the progress of local economic activities and making promptly a plan of mitigation measure if influence will come out, monitoring system ought to be set up by organization concerned.

3. Mitigation Measure for Environmental Impacts Associated with Implementation of Construction

The the construction activities on the project will all be subject to the constructions of general environmental legislation, specific regulations governing constructions procedures, and so on. As a result, it is considered that the most effective means for ensuring that potential construction impact are recognized and appropriate mitigative action taken is to include appropriate classes in the construction of good constructions and operational practices, rather than exceptional requirements.

The components of the constructions activities for which specifications will be prepared are as follows:

3-1 Constructions site preparation, operation and abandonment

3-2 The disposal of construction waste

3-3 The disposal and stabilization of excavated soil
3-4 The disposal and stabilization of dredged sediment
3-5 The stabilization and/or reclamation of borrow pit and quarry
3-6 Construction, operation and reclamation of temporary access road
3-7 The adoption of appropriate measures to protect river bank and bed and associated aquatic resource wherever there are works involving river and/or canal crossings by bridge, aqueduct, siphon or other river and/canal bank works
3-8 The maintenance of site hygiene through the provision of adequate toilet facility, good quality drinking water and system for the safe disposal of waste water and sewage
3-9 The enforcement of on-site safety including, where necessary, the provision of appropriate clothing and headgear
3-10 The safe disposal of any hazardous substances, including waste lubricating oil.

During construction implementation, the overall responsibility for site management will generally rest with the provincial water resources for the province in which the work is being executed.

4. Mitigation Measure for Public Health

As it was considered unlikely that the implementation of the proposed projects will contribute meaningfully to the any deterioration of public health, no specific mitigative measures have been identified. The following measures, that are understood to be currently practiced in all the project area, will be continued:

4.1 At regular intervals, the communal health centres will take random blood samples to examine the presence of malaria parasite. Positive Samples will be examined by the anti malaria control station and the anti malaria institute.
4.2 The medical officer at the anti malaria station and the centre for hygiene and epidemiology will monitor the density of mosquitos and larvae as well as rats.
4.3 Drinking water quality will be monitored for its microbiological and chemical characteristics in relation to the peak periods of pesticide and fertilizer use. This will be carried out annually by the Centre for Hygiene and Epidemiology.

IX. Environmental Management and Monitoring Plan

1. The Scope of the Overall Environmental Management Plan

The Overall Environmental Management Plan is being proposed in the frame of The ETA in order to ensure that all protection measures planned at feasibility and detail design stage, will effectively be implemented during construction and operation.

The Scope of the Overall Environmental Management Plan is as follow :

1-1 Planning of all environment related programs
1-2 Definition of coordination and management responsibilities
1-3 Definition of available institutional set-up, with the participation of all concerned Government Agencies.
1-4 Monitoring, control and follow-up actions.

2. Institutional Strengthening

2-1 The Project Management Council

An environmental protection component will be implemented under the responsibility of the Project Management Council and its Executive Committee. Major tasks of the environment component are as follows:

- Planning and management of all environmental protection measures.
- Definition of environmental standards and their integration in the provincial policy.
- Evaluation of results of monitoring and follow-up actions.
- Management of funds.

The activity will be supervised by the Environmental Protection Committees of the province and/or the Project Area, and representatives of the Provincial Authorities and Ministry of Science, Technology and Environment. Environmental activities will be mainly carried out by the Provincial Agricultural Services of the province through the respective departments, Fishery, Plant Protection, Irrigation-Drainage Management Company, Management Board and Agricultural Extension.

The Provincial Authorities of Environment ought to be set-up to carry out the environmental monitoring.

In addition the above, the strengthening of organizations are recommended as follows.

2-2 Existing water control and management organization (Irrigation-Drainage Management Company) ought to be strengthened for reasons mentioned below.
- The water control and operation rule ought to be reviewed according to the new drainage system strengthened.
- As agriculture in the area will develop in the increase of cropped area associated with the drainage improvement and introduction of diversified crops, the proper water supply control will be required to supply the adequate quantity of water timely.

2-3 For preventing excess use of agrochemicals which may be caused by the progress of intensive agriculture in future, the propagation and enlightenment scheme of proper agrochemicals use (including conservation of soil fertility) ought to be prepared by organization of research and extension.

3. Watershed Management

As mentioned in the previous chapter, it is important to recognize the dependance of this project on the upstream catchment area and/or surrounding area. Therefore it is necessary for this project to take the watershed management, as mentioned below, into consideration.

Watershed Management is usually provided by regional or national level authorities concerned. The purpose of the watershed management activity is to try and generally define the nature and scope of the activities in the catchment areas that will impact on the provision of water to the irrigation and/or drainage system and to provide some general recommendations on steps that need to be taken, to improve or, at least, stabilize conditions. It is not intended that these will form part of the mitigation plan, since the problem of catchment management is regional and national in nature and needs to be tackled in this context. It does, however, provide an indication of the seriousness of the problem and of the need to form an effective national plan of catchment management to ensure the best use of the soil and land resources of the catchment areas and the sustainability of the investment made in the drainage systems.

4. Environmental Monitoring

The provincial Authorities of environment will be established at the beginning of the construction stage, with the purpose of monitoring the program

implementation and effectiveness, assessing the program suitability to achieve the pre-set targets and evaluating the opportunity of policy revision at decision working level and the requirement for the program adjustment.

During the construction period, the monitoring ought to focus on the construction activity, including Contractors' performance in implementing environmental protection measures, disposal management plan and protection measures, water quality and use, namely fishery development, gardening and domestic uses as well as effectiveness of the entire environmental program.

The Provincial Authorities of environment will continue after construction is completed, covering all the environmental issues relevant to operation. From the viewpoint of assessing cost effectiveness, a critical review of the environmental program with yearly frequency would represent a very important component of the monitoring exercise. It will also be imperative that the officers in charge of the monitoring program achieve a complete interface with the local population in order to include the views of the concerned people in the assessment of the significance and impact of all environmental issues.

Specific monitoring subjects will be :

4-1 Fishery program
4-2 Water Resources use for irrigation, drainage and other purposes.
4-3 Impact on the vegetation and aquatic ecosystem in the project and downstream area
4-4 Water quality
4-5 Public health in relation to water borne diseases
4-6 Off-site environmental factors likely to affect the project (population, solid waste)

5. Cost of the Proposed Environmental Protection Measures

The cost of the proposed remedial measures to off-set potential negative environmental impacts is largely included in the construction and soil management components.

The cost of the proposed environmental measures made up by :

5-1 Compensation to farmers for the temporary loss of fertility in disposal areas
5-2 Protection measures against unforeseen damages during construction
5-3 Integrated Pest Management component
5-4 Fishery program
5-5 Environmental monitoring

5-6 Environmental management

The cost mentioned in the paragraph 5-1 and 5-2 should be included in the project cost. While the other cost (from the paragraph 5-3 to 5-6) should be estimated as the separate account from the project cost in the Overall Environmental Management Plan, which will be proposed in the frame of the EIA.

X. Refrences and Appendix

1. References Used in the Report of Environmental Analysis

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15- The Vietnam Ordinance on Aquatic Resources, 1989.

16- The Vietnam Ordinance on Endangered Species of Fauna and Flora, 1990.

17- The Vietnam Ordinance for Protected Areas Includes National Parks and Nature Reserves, 1990

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20- JICA, 1992, Environmental Guideline for Agricultural Development

2. Appendix

This paper is based on the data collected by THE STUDY ON IMPROVEMENT PROJECT OF DRAINAGE SYSTEM IN SOUTH BAC DUONG AGRICULTURAL AREA IN THE SOCIALIST REPUBLIC OF VIET NAM, of which main report and appendix are available for the appendix of this paper as it is.

The contents of the study report's appendix are as follows:

Appendix A- Participant to the study
B- Meterorology and Hydrology
C- Soil and Land Use
D- Agriculture and Inland Fishery
E- Irrigation and Drainage
F- Agricultural Infrastructure
G- Rural Society and Organization
H- Environment
I- Agro-Socio Economy and Project Evaluation

H－5 Environmental Impact Assessment (EIA)

Based upon the result of the Initial Environmental Examination (IEE), the Environmental Impact Assessment (EIA) was carried out. However, since there is room for further investigation, the final EIA ought to be prepared according to the result of detail design. The main issues in this EAI are summarized as follows:

H-5.1 Environmental Impact Associated with Change of Water Management

Assuming that the existing water management is changed without consideration, environmental impacts upon every aspects may come out. Particularly it is important to consider the influences which may be caused by the change of water management such as setting ordinary drainage water level, drainage network, irrigation network.

From the viewpoint of large size machinery workability and rotational cropping, lowering water level of drainage canal, that is changed by down of drainage canal bed and pumping drainage in the term of ordinary drainage, is desirable for the non-irrigation period or upland cropping.

while from not only an economical viewpoint, such as increase of construction and management cost, increase of water requirements, but also environmental viewpoint, as mentioned below, lowering water level of drainage canal is not favourable in this area.

(1) Occurrence of Troublesome Characters of Soil because of Water Level Down

The water level down in the ordinary drainage (for example, reformation into well-drained paddy field) without consideration may cause the low productivity of cultivated land because of the troublesome characters of soil such as the Permanently Flooded Alluvial Soils.

For the prevention of the occurrence of troublesome characters, it is indispensable to secure sufficient amount of irrigation water which is estimated at more than 10mm/day.

Judging from the above, the change of existing ordinary drainage water level ought to be minimized in this stage. In the future, reformation into well-drained paddy field is indispensable to increase agricultural productivity. However, the improvement ought to be phased out.

(2) Deterioration of Water Quality because of Water Level Down

The water level down in the ordinary drainage without consideration may cause deterioration of water quality, that may give influences upon the ecosystem, because water flow in canals has the role of environmental preservation, such as flushing out domestic waste water, keeping food chain, etc.

Accordingly, the change of existing ordinary drainage water level ought to be minimized even in the case of improvement of canals, until the sufficient amount of maintenance water requirement will be secured.

(3) Influence upon Custom of Water Use

The drastic change of water management, especially water level down caused by the change of irrigation and/or drainage network, may give influences upon the custom of water use such as domestic water supply, fishing water requirement. Because most of domestic water supply are depending upon shallow wells which are under the influence of water level of paddy field and/or canals. Moreover, fishing water requirement is under the influence of water level of canals.

Judging from the above, the change of existing irrigation and drainage network ought to be minimized in this stage.

(4) Change of Sedimentation

In the Red River Delta, sediment concentration is high. The concentration of suspended materials was 847 mg/lit on an average and 6,530 mg/lit in the maximum, as reported.

Assuming that the existing water management (especially the irrigation network) is drastically changed without consideration, the fertility of farm land may be influenced by the change of sedimentation.

Accordingly, the change of irrigation network ought to be minimized.

(5) Influence upon Scene of Cultural Inheritance

In this area, there are many pagodas, artistic architectures and famous places that are familiar with regional residents.

The water level change without consideration may give influences upon the scene of such cultural inheritances, because most of them are located against ponds or small lakes.

Judging from the above : as mentioned from (1) to (5), the most effective countermeasure for the impacts is that the change of the existing water management such as setting ordinary drainage water level and irrigation and drainage network, ought to be minimized and phased out.

Moreover the improvement of existing water control and management organization after implementation of this construction is recommended for reasons mentioned below.

1) The water control and operation rule ought to be reviewed, according to the new drainage system strengthened by the increase of pumping drainage discharge.
2) As agriculture in the area will develop in the increase of cropped area associated with the drainage improvement and introduction of diversified crops, the proper water supply control will be required to supply the adequate quantity of water timely.

H-5.2 Negative Influence Associated with Local Economic Activities

The progress of agricultural development and/or urbanization may cause not only positive influences but also negative influences in the Study Area as follows.

(1) Increase of Agrochemicals Use

In this study, the soil and the water quality in the cultivated land of the project area were tested to analyze the remaining pesticide. The measured value of them were within the limits of the criteria established by the Plant Protection Department Center of Pesticide Control of Viet Nam.

However, the progress of intensive agriculture may cause the increase of agrochemicals use in the area. There is possibility that disorderly agrochemicals use will give influences upon the ecosystem.

(2) Deterioration of Soil Fertility

The agriculture in the area will develop in the cropped area associated with drainage improvement and introduction of diversified crops. Such a progress of intensive agriculture tends to cause deterioration of soil fertility by crop planting, failure in soil management, etc.

(3) Deterioration of Water Quality and Ecosystem

The implementation of this project will induce local economic activities through development of agriculture in the Project Area. Moreover the growth of capital Hanoi City will induce urbanization in and around the Project Area.

Such a progress of local economic activities and urbanization may cause the increase of domestic waste water and waste of every kind, that may cause the deterioration of water quality and ecosystem.

The countermeasures for the influences are as follows.

1) For preventing excess use of agrochemicals, the propagation and enlightenment scheme of proper agrochemicals use (including conservation of soil fertility) ought to be prepared by organization of research and extension.
2) For checking on the deterioration of environmental conditions caused by the progress of local economic activities and making promptly a plan of mitigation measure if influence will come out, monitoring system ought to be set up by organization concerned.

H-5.3 Environmental Impacts Associated with Implementation of Construction

There is possibility that the construction activities will give impacts on the environmental condition in the Project Area. the results of assessment for the each possibility of impact are as follows:

(1) Influences on Downstream Area and/or Downstream Channel

The new pumping station will not give influences on the downstream and/or downstream channel because pumping drainage will be controlled by warning water level of the rivers such as the Red River, the Duong River, Thai Binh River, moreover there is no comparison between the discharge of the rivers and the discharge of pumping drainage from the project area in flood season.

(2) Influences on Residential Environment Associated with the Establishment of New Pumping Station

The new pumping station will not give influences on the residential

environment because the site is located more than about 300m from the nearest settlement, and land acquisition for new pumping station and related facilities will be small scale.

Moreover, the site of new pumping station is used as mediocre paddy field, in where endangered species of flora and fauna do not inhabit.

(3) Occurrence of Construction Waste of Every Kind

The disposal of construction waste such as surplus soil, the residue from the demolition of existing concrete structure, useless metals, wooden components, etc. ought to be carried out.

(4) Occurrence of Erosion and/or Sediment because of Bare Land after Excavation at Borrow Pit and/or Quarry

In the hillsides scattered in the Study Area, there are some quarries, in which erosion has occurred because of awkward disposal after quarrying. (The cause of erosion in the Project Area is not only awkward disposal after quarrying but also deforestation.) The bare land ought to be adequately disposed in order to prevent the erosion and/or sediment at borrow pit and/or quarry.

(5) Influences on Worker's Health and Environmental Condition such as Water Quality, Noise, Dust

The safety control for the condition of worker's health such as the maintenance of site hygiene, the provision of appropriate clothing and headgear, and the surrounding environmental condition such as water quality, noise, dust, ought to be carried out in the construction term.

(6) land Acquisition for New Pumping Station and Related Facilities

It is necessary for improvement of pumping station and related facilities to compensate for acquiring land in the project.

The notice concerning compensation for acquiring land in the project is as follows:

1) Keeping their means of living more than the present condition at least.
2) Acquiring substitutive land in the same elementary settlement if possible.

H－6. Environmental Conservation Program

Based upon the results of the EIA, the environmental conservation program was recommended, and was divided into 3 stages such as Term of Planning, Term of Construction and Term of Management.

H-6.1 Term of Planning

Most important of all is that taking influences upon environment into consideration, adequate plan and design ought to be prepared.

(1) Notice on Irrigation and Drainage Plan

Taking environmental influences caused by the change of water management into consideration, the new irrigation and drainage plan in the project ought to be prepared. Especially it is important to consider setting of ordinary drainage water level, drainage network and irrigation network. Moreover, as mentioned in the preceding paragraph, the change of existing ordinary drainage water level (for example, reformation into well-drained paddy field) and network ought to be minimized and phased out in this project.

(2) Overall Environmental Management Plan

The overall environmental management plan ought to be proposed in the frame of EIA in order to ensure that all protection measures which are planed in the detail design stage will be implemented effectively during construction and operation.

(3) Scheme for Compensation

It is necessary for the improvement of pumping station and related facilities to compensate adequately for acquiring land and/or temporary loss of fertility in disposal area.

H-6.2 Term of construction

For controlling sudden impacts caused by the construction, adequate schemes ought to be prepared. Thinkable schemes are as follows:

(1) Mitigation Measures against Impacts Associated with Construction Activities

Mitigation measures against impacts associated with construction activities will be proposed in the overall environmental management plan.

The major mitigation measures are as follows:

1) Disposal of construction waste of every kind
2) Disposal and stabilization of excavated soils
3) Stabilization and/or reclamation of borrow sites and quarries
4) Safety control for worker's health
5) Safety control for surrounding environmental condition such as water quality, noise, dust, and so on

(2) Monitoring for Environmental Condition during Construction

For checking upon the environmental condition as mentioned above during the construction, the responsible monitoring system ought to be prepared.

H-6.3 Term of Management

For promoting sustainable development in the Project Area, adequate management plans ought to be prepared.

(1) Strengthening of Organization for Water Control and Management

According to the new irrigation and drainage system, the strengthening of organization for water control and management is recommended, will induce not only the efficient use of water but also the conservation of environment. Because the land use of this area has been mainly paddy field and ponds from old times, the distribution and control of water is an important control factor for environment in the project area.

(2) Strengthening of Research and Extension Activity for Agrochemicals Use

For preventing excess use of agrochemicals, the propagation and enlightenment scheme of proper agrochemicals use (including scheme of conservation of soil fertility) ought to be prepared by organization of research and extention, which ought to be strengthened with other purpose.

(3) Recommendation for Setting up Monitoring System

For checking upon the deterioration of environmental conditions such as water quality, soil, etc. caused by the progress of local economic activities, according to the environmental criteria, and making promptly a plan of mitigation measure such as waste water treatment, solid waste treatment and disposal, waterworks, etc. if influence will come out, monitoring system ought to be set up by organization concerned.