APPENDIX D

SOCIO-ECONOMIC STUDY

APPENDIX D - SOCIO-ECONOMIC STUDY

1.0 METHODOLOGY

To gather the data required, the study uses three techniques. First is the conduct of a sample survey using a household questionnaire. The survey covered 79 households in the six barangays in the direct impact area. The barangays are as follows: Lumbad and Sagpatan in the municipality of Dingras and Bagbag, Bubuos, Nalasin and Lipay in the municipality of Salsona. These barangays are chosen being located in a high intensity flooding area. Their total number of households is 772. The sample size is computed to have a desired reliability of 95% and a maximum sampling error of 10 percent. The second technique is the interview of key informants. These are persons considered knowledgeable on the social services and environmental problems in the barangay. The concerned government personnel and barangay officials will serve as key informants. The third technique is the collection of secondary data from the National Statistics Office, health centers and municipal hall of the municipality where the project is located.

2.0 SOCIO-ECONOMIC SETTING

2.1 Demography

Population Size and Growth

One city and eight municipalities in Ilocos Norte serve as the direct impact area of the project. The city is Laoag while the municipalities are as follows: Carasi, Dingras, Marcos, Nueva Era, San Nicolas, Sarrat, Salsona and Piddig. The direct impact area has close to half (47%) of the population of the whole province. This is the size of the population exposed to the yearly flood in the Laoag River Watershed. The direct impact area has a combined population of 218,000 in 1990 and 228,323 in 1995 (Table 1). Within the five-year period, the direct impact area sustained a growth rate of 0.9 % per year. This is the same as the growth rate of the whole province. The growth rate in the direct impact area and the province is very low compared to the national population growth rate during the same period which is 2.3 percent.

Table 1
Selected Data on the Characteristics of the Population
of the Direct Impact Area and Ilocos Norte

Item	Direct Impact Area	Ilocos Norte
1990 population	218,000	461,661
1995 population	228,323	482,651
Annual growth rate (in percent)	0.9	0.9
Persons living in the same residence in the past five years (in percent)	95	96
Total land area (in sq km)	1,526.5	3,399.0
No. of persons per sq km.	150	142
Average members per households	4.8	4.8
Dependents per 100 persons (in percent)	73	73
Persons over 6 years old without any education (in percent)	5	5
Average number of years spent in school	8	6

Source: National Statistics Office

The increase of population is a result of natural increase (number of birth minus number of death) and net migration (number of in-migrants minus number of out-migrants). In 1995, there are 22 persons born per 1000 population in Ilocos Norte (versus 23 at the national level) and 6 persons died (versus 4 at the national level). Thus, their average natural increase is 16 persons per 1,000 population or just slightly lower than the national level. The natural increase in the direct impact should not largely diverge from provincial rate and the natural increase in the area should be about the same as the provincial rate.

About 95% of the population in the direct impact area have been living in the same municipality (or city in the case of Laoag) in at least the past five years. This indicates that in-migration into the area is very low. Within that period the number of persons who moved into the municipalities where they are living now or the inmigrants compose only 5 % of the population. The percentage of in-migrants for the whole province of Ilocos Norte is slightly lower at 4 percent. At the national level, it is 5 percent. The natural increase and in-migration rate in the direct impact area and the province is close to the national level. This means that the only explanation for the lower growth rate in the direct impact area and the province compared to the national rate is high out-migration.

Population Density

With a total land area of 1,526.5 sq km, the direct impact area has an average population

density of 150 persons per sq kilometer. The flood control project is going to benefit the more densely populated area of the province. Ilocos Norte which has 142 persons per sq km or lower than in direct impact area. Nonetheless, the direct impact area and the province has still higher density than the national level which registers at only 230 persons per sq km.

Household Size, Dependency Ratio and Educational Attainment

The population of the direct impact area is distributed among 47,716 households resulting to an average of 4.8 members per household. This household size is the same as the provincial average. The household size in the direct impact and Ilocos Norte reflect the dominance of children in the population. Households usually have two adults and two or three children. In the direct impact area, 35% of its population are aged below 15 years. Those aged over 64 years compose 7 percent. Both age groups are considered dependents of the economically active population whose ages range from 15 to 64 years. The economically active persons constitute 58% of the population. Thus, every 100 economically active persons in the beneficiary area has 58 dependents. The dependency burden at the provincial level is the same.

Among persons aged seven years and over in the direct impact area, 5% are without any education. The same percentage prevails at the provincial level.. But the average eduational attainment in the direct impact area is Second Year High School having spent eight years in school. The population of Ilocos Norte has lower average educational attainment having reached only Grade 6 having spent six years in school.

2.2 Housing Characteristic

House and Homelot Ownership

About 92% of the households in the direct impact area own their houses (Table 2). This ownership rate is higher than the rate for Ilocos Norte where the homeowners constitute only 88 percent. However, the ownership of the homelot is much lower in the direct impact area and the province. Only 74% of the households in the direct impact area own the lot where their houses stand. The homelot ownership rate is slightly lower in the province at 73 percent. The non-ownership of land is relatively high and reflects the fact that it is not easily affordable.

But there are few renters. Around 25% of the households in the direct impact area are occuying their homelot for free. At the provincial level, the percentage is 23 percent. The renters constitute only 1% in the direct impact area and 4 % at the provincial level.

Housing Structure and Materials

The types of housing structures further indicates the level of housing affordability. The more affordable housing is, the more households live in a single house. The households who live in a single house constitute 98% in the direct impact area. In the provincial level, they constitute 99 percent or about the same as the direct impact area.

Table 2
Selected Data on the Housing Characteristics in the Direct Impact Area and Ilocos Norte: 1990

Item	Direct Impact Area	Ilocos Norte
Percentage of homeowners	92	88
Percentage of homelot owners	74	73
Percentage of houses by type of structure		
Single house	98	99
Multi -unit structure	2	1
Total	100	100
Percentage of houses by type of roof		
Galvanized iron/aluminum	82	76
Cogon/nipa/anahaw	15	21
Others (tile, wood etc.)	3	3
Total	100	100
Percentage of houses by type of wall		
Concrete/brick/stone	29	27
Concrete and wood	36	31
Wood	7	10
Bamboo/cogon/nipa	26	30
Others	2	2
Total	100	100

Source: National Statistics Office

The housing materials used indicate the economic status of the population. The use of concrete and other permanent materials for housing is taken as an indicator of higher economic status. The material most widely used for roofing in the direct impact area is galvanized iron (GI) sheet being used by 82 percent. Only 76% use similar material in the provincial level. Less widely used in the direct impact area are cogon or nipa. The houses roofed with these materials as roof constitute 15 percent. But 21% of the houses of Ilocos Norte have cogon or nipa. This indicates that the households in the direct impact area may be slightly better off economically compared to the households in the province in general.

For walling, concrete combined with wood is the most widely used materials in the direct

impact area as well as in the province. But there are more users of the materials in the direct impact area (36%) than in the in the province (31%). The same with pure concrete which is used by 29% of the households in the direct impact area. Only 27% use the same material at the provincial level. Because concrete is more expensive than the other walling materials, the higher economic status of the households in the direct impact area is again indicated.

Lower priced walling materials such as cogon, nipa and bamboo are more common in the province being used by 30 percent. Only 26% uses the same materials in the direct impact area. The same with wood which is still relatively readily available in Ilocos Norte. It is used in 10% of the houses in the province but only 7% in the direct impact area.

2.3 Housing Utilities

Toilet and Water Facilities

The ownership of toilet facilities is high in both the direct impact area and the province at 99% (Table 3). The most widely used toilet facility in the direct impact area and the province is the water sealed type. This is used by 92% of the households in the direct impact area and by 88% in the provincial level. The higher percentage of households in the direct impact area using water-sealed toilets may be again taken as an indication of the better economic status of its households. The other types of toilet facilities that are used by a lesser number of households in the direct impact area and the province are the closed and the open pit types.

Table 3
Selected Data on the Housing Utilities
in the Direct Impact Area and Ilocos Norte: 1990

Item	Direct Impact Area	Ilocos Norte
Percentage of households by type of toilets used		
None	1	1
Water sealed	92	88
Closed Pit	3	5
Open pit	3	3
Others	1	1
Total	100	100
Percentage of households by source of drinking water		
Faucet	27	27
Deepwell	32	31
Shallowwell	9	8

Dug well	29	31
Others	3	3
Total	100	100
Percentage of households by type of cooking fuel		
Liquefied Petroleum Gas	28	22
Wood/ charcoal	67	74
Others	5	5
Total	100	100
Percentage of households who uses electricity for lighting	86	80

Source: National Statistics Office

For drinking water, the higher percentage of households rely on either deep well or a dug well. The users of the deepwell constitute 32% in the direct impact area and 31% in the province. Dug well which is not considered a safe source is used by 29% in the direct impact area and 31% in the province. The users of a faucet in the direct impact area and in the province comprise 27%, respectively. Water sources used by smaller portions of households are shallow well and open water bodies. For drinking water, the higher percentage of households rely on either deep well or a dug well. The users of the deepwell constitute 32% in the direct impact area and 31% in the province. Dug well which is not considered a safe source is used by 29% in the direct impact area and 31% in the province. The users of a faucet in the direct impact area and in the province comprise 27%, respectively. Water sources used by smaller portions of households are shallow well and open
water bodies.

Cooking Fuel and Lighting

The most widely used fuel for cooking in the direct impact area and the province is still wood or charcoal. But there are less users of wood or charcoal in the direct impact area (67%) than in the province (74%). More households in the direct impact area cook with liquefied petroleum gas (LPG). They constitute 28% in the direct impact area but only 22% in the in the province. This may be again taken as an indicator of the better economic position of the households in the direct impact area. There is also higher proportion of households served by electricity in the direct impact area. Around 86% of the households use it for lighting. Only 80 percent of the households in the province enjoy similar facility.

2.4 Social Services

Education in the direct impact area and in Ilocos Norte is mainly provided by the government. The direct impact area has are 178 public elementary schools or 51% of the

total number of public elementary schools in the province (Table 4). It has 16 of the 33 public secondary schools in the province. It has also one of the 5 public tertiary schools in the province.

Health care is similarly mainly provided by the government. The direct impact area has 6 of the 9 hospitals in the province. It also has 54 of the 100 barangay health stations in the province and 13 of the 26 rural health units.

The municipalities in the direct impact area are interconnected by a network of national, provincial and municipal roads. The province has 3,338 km of roads, 10% of which are concrete and 5% are paved with aspalt. The remaining 85% are paved either with gravel or earth.

Table 4
Social Services in the Direct Impact Area and Ilocos Norte

Social Services	Direct Impact Area	Percentage of the Provincial Total	Ilocos Norte
Educational Services			
Public Elementary Schools	178	51	349
Public Secondary Schools	16	48	33
Public Tertiary School	1	25	5
Health Services			
Public Hospitals	6	67	9
Barangay Health Stations	54	54	100
Rural Health Units	13	50	26

Source: Department of Education and Culture and Department of Health

2.5 Employment and Income

The employment and income in the direct impact area are characterized from the result of the sample survey conducted in six barangays located in an area with high flooding intensity. These barangays are Bagbag, Bubuos, Nlasin and Lipay in Salsona and Sagpatan and Lumbad in Dingras. Among the population in the six barangays whose ages are 15 years old and over, 46% are gainfully employed and 54% are non-gainfully employed (housekeepers, students and pensioners) (Table 5). Gainful employment is heaviest in farming accommodating 24% of the total employed workforce. The predominance of this sector is the same throughout Ilocos Norte l where it has 26% of the employed labor force. Such predominance reflects the heavy rural orientation of the

economy in the direct impact area and in the province. This means that employment characteristics are not highly diversified that dependence on one sector prevails.

The far second concentration in the six barangays is in officials, executives and proprietors sector as well as in professional sector, each having only 5% of the total employed workforce. The professionals mostly include school teachers and midwives. A considerable proportion of 4% are in craft and related work. These include carpenters, sewers, handicraft makers and mechanics. There are few employed in elementary occupations. This sector has 3% of the labor force and include market stall vendors, street services providers, domestic helpers and farm laborers. Elementary occupations are the second biggest employers in the province of Ilocos Norte with 7% of the total employed labor force.

Table 5
Data on Employment and Income Among the Surveyed Households in the Direct Impact Area and Ilocos Norte

Item	Surveyed Households	Ilocos Norte
Persons aged 15 years old and over by occupation		
Gainful occupations (in percent)		
Officials, executives and managers	5	2
Professionals	5	2
Technicians and related professionals	1	1
Clerks	1	1
Service and market sales workers	4	2
Farmers, forestry workers and fishermen	24	26
Craft and related workers	1	4
Plant and machine operators and assemblers	2	3
Elementary occupations	3	7
Non-gainful occupations		
Students	23	15
Housekeepers	25	33
Pensioners	6	4
Total	100 %	100 %
Percentage unemployed persons	8 %	9 %
Average household income per month	P 6,544	P 5,160

Source: February 1993 Survey and National Statistics Office

Unemployment in the direct impact area stands at 8% or about the same as the unemployment rate in province in 1990 (9%). The national unemployment rate is at 8

percent.

The average household in the six barangays earns about P6,544 per month. This is more than the 1994 average income of the households of Ilocos Norte which is P5,160 per month. In the six barangays, most households have two sources of income. Their main sources are farming and salaries and wages. Farming contributes 37% of the total income while salaries and wages contribute 34 percent. The rest are earned from the following: livestock sale (8%), pension (7%), business enterprises (6%), farm share (3%), remittances (2%), fishing (2%), and rented out properties (1%).

Apart from being the main contributor of household income, farming is the main employer in the six barangays. Around 95% of the households derive income from farming. Livestock raising ranks second being the source of income of 71% of the households. The households who earn salaries and wages constitute only 37 percent. Although fishing has small contribution to household income being a subsistence activity, 35% of the households in the six barangays earn from it. The percentage of households who earns from other income sources are as follows: business enterprises (18%); share from farmlands (22%); pension and allowances (18%); remittances from relatives (32%); and property rentals (2%).

2.6 Farming and Fishing

As seen in the employment chracteristics and income composition, the economy in the direct impact area is largely supported by farming. The farming households in the direct impact area cultivate two or three crops. The most widely cultivated are rice and corn. But tobacco, garlic, mongo and an assortment of vegetables are also raised.

The direct impact area has 31,300 has of riceland (Table 6). This area respresents 65% of the total riceland in the province. Rice are usually harvested twice a year. The average yield in the direct impact area is 3.8 MT per hectare or much higher than the average yield in the province which is only 2.6 MT per hectare. This points out that within the direct impact area are the most productive riceland in the province. The total yield in the direct impact area per year amounts to 124,000 MT or 95% of the total rice production in the province. Thus, the direct impact area is pivotal in the food sufficiency of the province.

Corn is cultivated in a much smaller scale in the direct impact area. It is usually planted in the riceland area during dry season. The direct impact area has 2,900 has of cornland. This size represents 97% of the total cornland of the province. This further bolster the position of the direct impact area as the grain granary of the province. The average production in the direct impact area of 3.3 MT of corn per hectare is about the same as the provincial average. Its total corn production is 8,700 per year or 43% of the total corn production of the province.

Like corn, garlic and tobacco are planted in the direct impact area usually as a dry season crop. About 1,400 ha. are planted to garlic and 1,000 ha. are planted to tobacco. The area planted to garlic compose 35% of the total garlic farm in the province while the area planted to tobacco compose 32% of the total tobacco farm. Its garlic yield is 44% of the provincial production and its tobacco harvest is 33 percent. The high share of the direct impact area in the provincial production relative to the proportion of land devoted to it is due to higher yield per hectare. The garlic yield in the direct impact area is 3.0 MT per hectare but the average for the province is only 2.4 MT per hectare. The average yield for tobacco in the direct impact area is about the same as the provincial average.

Table 6
Selected Data on the Farming Activities of the Sample Households in the Direct Impact Area and Ilocos Norte: 1995

Item	Direct Impact Area	Ilocos Norte
Area by Crop (in 000 has)		
Rice	31.3	48.3
Corn	2.9	5.9
Garlic	1.4	4.0

Tobacco	1.0	3.1
Average Yield (MT/ha)		
Rice	3.8	2.6
Corn	3.3	3.4
Garlic	3.0	2.4
Tobacco	1.1	1.2
Total Production (000 MT)		
Rice	n 124.1	130.0
Corn	8.7	20.3
Garlic	4.3	9.7
Tobacco	1.2	3.6

Source: Provincial Agriculture Office and Bureau of Agricultural Statistics

Based on the sample survey in the six barangays in the direct impact area, the average farming household cultivates an average of 1.1 hectares. Only 40% of the farmland are owner-cultivated. The remaining 60% are tilled by tenants. Although most households in the six barangays worked on land under a single arrngement, some has dual arrangement. Around 37% are stricly owner cultivator and 32% are exclusively tenant. Another 11% are land owners who have tenants to work on their land. But 11% cultivate their own land and at the same time work on the land of others as tenants. The remaining 9% are owner cultivator and have piece of land being worked by tenants.

In the six barangays, fishing is normally engaged as a supplementary food procurement activity but not a full-time market oriented one. Those who fish engage in the activity at an average rate of seven times per month. Every engagement, they take home an average of 1.7 kg of catch. The Nacoton, Tina, Cura and Padsan Rivers serve as the fishing ground. All the fishing households count on the spear (pana) as their fishing gear while hook and line are used by 57 percent. Others gears used are fiish trap and nets.

2.7 Cultural Minorities

The direct impact area and the whole province of Ilocos Norte are dominated by the lowland group ethologically classified as Ilocano. They constitute about 97% of the population of the direct impact area and the province. The largest non-Ilocano ethnic group in the direct impact area and the province are the Tagalog. They constitute about 1% of the respective total population. But the Tagalog, like the Ilocano, belongs to the cultural mainstream. Among the cultural minorities, the Isneg is the largest group in the direct impact area and the province. They compose 0.2 % of the population in the direct impact area and 0.5% in the province (Table 7). The Isneg is considered a subgroup of the entho-linguistic group collectively called Igorot. This group is geographically associated with the Cordillera Region and the Isneg is mostly found in the province of Apayao. Thus, they are also called Apayao. Because Ilocos Norte shares border with Apayao, Isneg are also found in the province. In the direct impact area, they are

concentrated in the municipality of Carasi which has a population of 750. Half of the population are Isneg.

Although its name comes from the Ilocano term which means inhabitants of the Tineg River, the Isneg have accepted it to call themselves. Their economy largely relies on slash and burn farming although they mostly live along rivers which serve as a main source of food. They grow upland rice as their main crop supplemented by rootcrops and vegetables. Planting begins in February or March when the omens which signal the start of the cropping season appear. The omens include the appearance of the red birds (bakawkaw), blooming of the coral tree (tablang) and the shedding off of the leaves of another tree (basikalan). Swidden sites are usually portions of mountain slopes which have been left to fallow for five to seven years. Farming activities are accompanied by several rituals and observance of beliefs. For instance, ashes and herbs are scattered by the tiller behind him as he utters prayers to the spirits before opening the field. Musical instrument is is not allowed in the field so as not to attract the birds which will destroy the crop. The women, who usually do the planting, throw few grains in the field the day before planting and utters prayers to the rats and offer reparation to the spirits. Just before harvest, a supply of betel chew is placed near the farmer's hut for the daily use of the spirits.

Table 7
Ethnic Background of the Population
in the Direct Impact Area and Ilocos Norte: 1990

Ethnic Background	Direct Impact Area	Ilocos Norte
Ilocano	96.7	96.6
Tagalog	1.3	1.3
Isneg	0.2	0.5
Others	1.8	1.6
Total	100.0	100.0

Source: National Statistics Office

The Isneg live together in 15 to 30 families. It is traditionally headed by the headman (mengal). A person becomes a headman based on wealth, courage and knowledge of the local lore. A reputation of being just is also important because he settles disputes as one of his functions. Working together is based on reciprocity. This is strengthened by the kinship system which is reckoned on both sides. The Isneg have their own ancient alphabet containing 12 consonants and three vowels. They are traditionally animist believing in a number of spirits. Ceremonies are performed by the shaman who is a woman. Included among her functions are the distribution of amulets and the treatment of

various ailments.

Most present-day Isneg, including those in Carasi, consider themselves Christians. They have been converted to Catholicism or to some Protestant sect particularly during the American regime. Many Isneg are no longer farmers and many have established themselves in various occupations through formal schooling. They have also intensified their economic interaction with the mainstream population and intermarriage is not rare. The mass media have also penetrated the once isolated social system. These social processes worked together to hasten the acculturation of the Isneg and the dilution of the traditional culture. While some Isneg have already turned their back on tradition, many are still staddling between the past and the present.

2.8 Archeological and Historical Sites

Ilocos Norte yielded no stone age remains during the archeological survey done by O.H. Beyer in 1947. However, he identified Late Tang and Early Sung midden dumps. Accidental excavation also yielded Late Sung, Yuan and Early Ming ceramic pieces. But the sites are usually along coastal areas where trade between pre-colonial inhabitants and Chinese merchants must have thrived. No historical site in the direct impact area is registered in the National Historical Institute. But its has fine specimen of Spanish Baroque Churches made of mortar and red bricks. The outstanding ones are the Sarrat Church and the ruins of the old Dingras Church. The use of red bricks for Spanish period churches is architecturally unique to the Northern Luzon because in Southern Luzon and the Visayas, stone bricks were the staple material.

2.9 Health

The leading cause of morbidity in Ilocos Norte is acute respiratory infection with 5,173 cases per 100,000 population in 1995 (Table 8). It has been the leading cause of morbidity in the province in the past five years. But the 1995 rate is much lower than the five-year (1990-1994) average which is 11,018 cases per 100,000 population.

Table 8
Leading Causes and Rate of Morbidity and Mortality
in Ilocos Norte (Per 100,000 Persons: 1995

Cause	1990-1994 Average	1995
Morbidity		
Acute respiratory infection	11,018	5,173
Injuries	3,806	3,737
Gastrointestinal disorder	2,609	977

Nutritional and vitamin difficiency	1,981	705
Influenza	1,802	635
Anemia	1,638	781
Skin problem	1,105	659
Musculo-skeletal disorder	716	2117
Parasitism	686	-
Hypertensive diseases	441	-
Heart disease	299	282
Mortality		
Heart disease	112	115
Pneumonia	78	79
Cancer	33	27
Hypertensive disease	27	16
Accident	22	16
Pulmonary Tuberculosis	21	25
Degenerative Disease	9	-
Liver Disease	6	6
Septicemia	4	9
Kidney Disease	3	5

Source: Provincial Health Office

Ranked second is injuries where there are 3,736 cases per 100,000 population in 1995. The rate is just slightly lower than the five-year average which is 3736 cases per 100,000 population. Gastrointestinal disorder which may result from drinking unsafe water is third with 977 cases per 100,000. This is a dramatic reduction from the five year average rate of 2,610 cases per 100,000. Other causes of morbidity in the province are nutritional and vitamin deficiency, influenza, anemia, skin problem and musculo-skeletal disorder. At the national level, the three leading causes of morbidity are bronchitis, diarrhea and influenza.

The leading cause of moratlity in Ilocos Norte is heart disease. There are 115 cases per 1000,000 in 1995 or just slightly lower than the five year average of 112 cases per 100,000. Pneumonia follows causing 79 death per 100,000 in 1995 and an average 78 deaths per 100,000 every year in five year period. The third leading cause of mortality is cancer with 27 cases per 100,000 in 1995. The rate is reduced from the five year average of 27 cases per 100,000.At the national level, pneumonia ranks first and heart disease ranks second. The third which is pulmonary tuberculosis ranks sixth in Ilocos Norte. Other leading causes of mortality in the province are cancer, hypertensive disease, accident and pulmonary tuberculosis. No case of endemic disease is recorded in the province.

2.10 Perception and Attitude

To identify the problems in the direct impact area, the respondents in the six barangays were asked to mention three of these problems. Around 92% of all the respondents mentioned at least one problem (Table 9). There are seven problems which are ranked first. But none is mentioned more frequently than flooding being ranked first by 89 percent. Other problems which are ranked first are typhoon, irrigation water, crime, gambling, livelihood, health center.

Soil erosion, which is a result of flooding, is the most frequently mentioned second ranked problem. It is mentioned by 31 percent. This is followed by bad roads being cited by 21 percent. Flooding still manged to sneak into the second ranked problems being mentioned by 8 percent. Other problems which are ranked second are typhood and destruction of irrigation system.

Among the third-ranked problem, bad road is the most frequently mentioned. Around 36% of the respondents consider this a problem. This is followed by lack of electricity (32%) and destruction of farmland (12%). The latter is again a result of flood. Other problems mentioned are the lack of irrigation water, lack of livelihood and landslide/erosion.

The awareness of the project among the respondents is quite high at 71percent.Although few give a complete description of the project, most correctly mentioned a part of it. Around 39% said its a dike intended to control flood while 21% said it involves dredging. Some 18% mentioned both as their description of the project. Other description given are dam and reforestation.

Table 9
Perceived Community Problems and Attitude Toward the Proposed Project by the Sample Respondents : February 1997

Item	Data
Percentage of respondents who mentioned a problem	92%
Percentage of respondents by problem ranked first	
Flood	89%
Typhoon	3
Irrigation Water during dry season	3
Others (crime, gambling, livelihood, health center)	5
Total	100%
Percentage of respondents by problem ranked second	
Soil erosion	31%
Bad road	21
Destruction of irrigation system	8
Typhoon	8
Flood	8

Others	3
Total	100%
Percentage of respondents by problem ranked third	
Bad road	36%
Electricity	32
Destruction of farmland	12
Landslide/ erosion	8
Lack of livelihood	8
Lack of irrigation water	4
Total	100%
Percentage of respondents aware of the project	71%
Percentage of respondents by description of the project	
Dike	39%
Dredging	21
Dredging and dike	18
Dam	11
Others	11
Total	100%
Percentage of respondents by source of information	
Barangay officials	36%
DPWH	30
Municipal officials	14
Government	9
Others	11
Total	100%
Percentage of respondents who are for the project	100%

The most frequently reported source of information about the project is the barangay officials. They are identified by 36% of the respondents. Another 30% pointed out the DPWH. The municipal offiacials and the government in general are the ones mentioned by 14% and 9% of the respondents, respwctively. All the respondents are for the implementation of the project. Nobody is against it.

2.11 Experience With Flood

Around 90% of the households in the six barangays surveyed experienced the flood in 1996 (Table 10). The flood lasted an average of 3.8 days. The average depth of the flood waters in front of the house of the respondent-household is 0.8 meters. About 52% of the respondents said the flood came on July although 36% gave a wider time frame of July-October. The flood in the six barangays appears to be closely associated with typhoons. Around 40% of the respondents pinpointed it as the cause of flooding. Some 22% consider river overflow as the cause of flood while 21% believe that the riverchannels are already so filled up with earth that the water naturally scatter itself.

Deforestation is also blamed by 9 percent for the flood.

Warning against the flood was reportedly issued and reached 75% of the households. Among the households who heard the warning, 92% identified the radio as the source. The barangay officials are credited by 8 percent. The warning is effective in prompting the households into taking a precautionary measure against the flood. A measure was underateken by 97 percent. Around 46% of them collected their household stuff and 21% moved their stuff to a location of higher elevation. Other measures taken were the construction of makeshift dike, transfer of domestic animals to safer areas and the strengthening of the house.

There are very few households who escaped from the damage brought about by the flood. The children were the first to suffer with 62% of the households having at least one child absent from school. The average duration of the absence is 4.3days. The absence is inevitable because roads are damaged by flood and the river is impassable when its water swells. When the water subsides and the roads are opened to traffic, the classsroom may be damaged.

The farm produce is the next in line with 54% of the households being hit. The flood can wipe out the crops just about to be harvested. This makes farming in the six barangays a big gamble. A damage of the house is being sustained by 47% and the farmland itself by 43 percent. Rocks and gravel covered the farmland and destroyed both the crops and the farm.

Table 10
Data on Flooding Experience of the Sample Households in the Six Barangays of the Direct Impact Area: February 1997

Item	Data
Percentage of households experiencing flood 1996	90%
Average no of days of the last flood experienced	3.8
Average depth of food waters in housefront at its peak (in meters)	0.8
Percentage of respondents by month flood is experienced	
May -October	36%
July	52
August	12
Total	100%
Percentage of respondents by cause identified for flooding	
Typhoon/heavyvrainfall	40%
River overflow	22
Shallow water channel	21
Deforestation	9
Others	8
Total	100%
Percentage of households who heard flood warning	75%

Percentage of respondents by warning source	
Radio	92%
Barangay captain	8
Total	100%
Percentage of households who took precaution	97%
Percentage of households by type of preacution done	
Collected household items	46%
Transferred things at higher elevation	21
Constructed a dike	12
Secured the domestic animals	9
Strengthen the house	5
Others	7
Total	100%
Percentage of households affected by flood (multiple response)	
Injury	8%
Sickness	25
House damage	47
Furniture damage	18
Appliance damage	11
Vehicle damage	5
Farm land damage	43
Farm produce damage	54
Livestock loss	13
Poultry loss	33
Fishpond loss	1
School absences	62
Work absences	40
Business closure	9

The flood also prevented the working members of 40 % of the households from going to work. The average duration of absence from work is 4 days. Around 33% of the households lost some poultry and 25% had some members of their family being sick. Less percentage of households incurred furniture damage (18%), livestock loss (13%), appliance damage (11%), business closure (9%), injury among its members (8%), vehicle damage (5%) and fishpond loss (1%). The flood had indeed destroyed not only human health but also properties and productivity.

APPENDIX E

SEDIMENT LOAD AND BALANCE

APPENDIX E - SEDIMENT LOAD AND BALANCE OF THE LAOAG RIVER BASIN

The use of sabo dams in this project is for the control of the aggradation rates of the riverbeds in the alluvial fan of the rivers. It is therefore important to understand the sediment load and balance of the Laoag River Basin. The estimated annual sediment deposition and riverbed aggradation in presented in Table E.1.

Sediments in the rivers are categorized into the following components: (1) wash load, (2) bed load, and (3) suspended load. The wash load is very fine in size and it originates from the surface of the land. It is usually assumed to be transported to the sea. The bed load are the sediments that are always in contact with the riverbed. These are transported downwards rolling or sliding on the surface of the riverbed. The suspended load are sediments that are not in contact with the riverbed all the time. Its settling force is smaller than the upward force component of the turbulent river water. This include coarse sand. The annual sediment (bed and suspended load) runoff from the mountains are presented in Table E.2, while Table E.3 presents the specific sediment yield of the rivers.

Sediment runoff from the mountains to the alluvial fan during a big flood is considered very large which could easily cause a much aggradated fan apex due to the limited sediment transport capacity of the river channel. It is therefore important to know the sediment balance at the fan apex during a large flood such as a 25-year flood. Table E.4 summarized the sediment balances.

Overall, the annual sediment balance of the Laoag River Basin is presented in Table E.5. Estimated annual sediment deposition is presented Table E.6, while the amount of existing sediment deposits in the valley are found in Table E.7.

Table E.1

ESTIMATED ANNUAL SEDIMENT DEPOSITION
AND RIVERBED AGGRADATION

RIVER	ANNUAL DEPOSITION (1,000 m^3/yr)	ANNUAL AGGRADATION (cm/yr)
Cura/ Labugaon	144.2	3.0
Solsona/ Madongan	270.1	5.1
Papa	72.7	4.8
Upper Bongo	44.9	1.6
Lower Bongo	16.1	0.4
Laoag	77.9	0.5
Total	625.9	

Table E.2

ANNUAL SEDIMENT (BED AND SUSPENDED LOAD) RUNOFF
FROM THE MOUNTAINS

RIVER	CATCHMENT AREA (km^2)	ANNUAL SEDIMENT RUNOFF (m^3)	SPECIFIC SEDIMENT RUNOFF (m^3/km^2)
Cura	69.5	54,600	790
Labugaon	100.5	154,700	1,540
Solsona	79.0	114,500	1,450
Madongan	153.8	223,100	1,450
Papa	51.4	99,600	1,940
Bongo	57.0	78,300	1,370
Total	529.8	724,800	1,420

Table E.3

SPECIFIC SEDIMENT YIELD OF RIVERS

RIVER	CATCHMENT AREA (km^2)	SEDIMENT YIELD ($1,000\ ^3$)	SPECIFIC YIELD ($m^3/yr/km^2$)
Cura	69.5	661	2,110
Labugaon	100.5	906	2,000
Solsona	79.0	902	2,540
Madongan	153.8	1,472	2,130
Papa	51.4	374	1,620
Bongo	57.0	369	1,440
Others	18.6	109	1,300
Total	529.8	4,793	2,010

Note: The column for sediment yield is the estimated total sediments from slope failure and surface erosion during the period September 1991 to April 1996.

Table E.4

LARGE FLOOD SEDIMENT BALANCE

RIVER	SEDIMENT TRANSPORT VOLUME ($1,000\ m^3$)		
	INFLOW TO ALLUVIAL FAN	TRANSPORT AT FAN APEX	BALANCE
Cura	71.3	42.6	28.7
Labugaon	185.2	112.8	72.4
Solsona	166.9	108.9	58.0
Madongan	454.5	302.8	151.7
Papa	147.3	93.0	54.3
Upper Bongo	97.5	63.4	34.1
Total	1,122.7	723.5	399.2

Table E.5

ANNUAL SEDIMENT BALANCE OF THE LAOAG BASIN

ITEMS	ANNUAL VALUES
Sediment Yield in Watershed	1,065,100 m^3 (2,010 $m^3/yr/km^2$)
Sediment Runoff at Fan Apexes - Wash Load - Bed and Suspended Loads	903,700 m^3 (1,770 $m^3/yr/km^2$) 178,900 m^3 (350 $m^3/yr/km^2$) 724,800 m^3 (1,420 $m^3/yr/km^2$)
Sediment Runoff from Guisit R. - Wash Load - Bed and Suspended Loads	70,600 m^3 (400 $m^3/yr/km^2$) 62,400 m^3 (350 $m^3/yr/km^2$) 8,200 m^3 (50 $m^3/yr/km^2$)
Sediment Runoff from Remaining - Wash Load - Bed and Suspended Loads	221,600 m^3 (350 $m^3/yr/km^2$) 221,600 m^3 (350 $m^3/yr/km^2$) negligbly small
Sediment Runoff to the Sea - Wash Load - Bed and Suspended Loads	570,000 m^3 (430 $m^3/yr/km^2$) 462,900 m^3 (350 $m^3/yr/km^2$) 107,100 m^3 (80 $m^3/yr/km^2$)

Table E.6

ESTIMATED ANNUAL SEDIMENT DEPOSITION

LOCATION OF DEPOSITS	ANNUAL DEPOSITION
Around the Alluvial Fan Apexes	192,400 m^3 (31%)
Middle Reaches in Alluvial Fan	288,800 m^3 (46%)
Around the Alluvial Fan Ends	50,700 m^3 (8%)
In the Lower Bongo River	16,100 m^3 (3%)
In the Laoag River	77,900 m^3 (12%)
Total	625,900 m^3 (100%)

Table E.7

EXISTING SEDIMENT DEPOSITS IN THE VALLEY

RIVER	CATCHMENT AREA (km^2)	DEPOSITED VOLUME ($1,000\ ^3$)	SPECIFIC VOLUME (m^3/km^2)
Cura	69.5	2,854	41,100
Labugaon	100.5	5,694	56,700
Solsona	79.0	1,448	18,300
Madongan	153.8	12,125	78,800
Papa	51.4	2,395	46,600
Bongo	57.0	1,926	33,800
Total	511.2	26,442	51,700

APPENDIX F

PROJECT PHOTOS

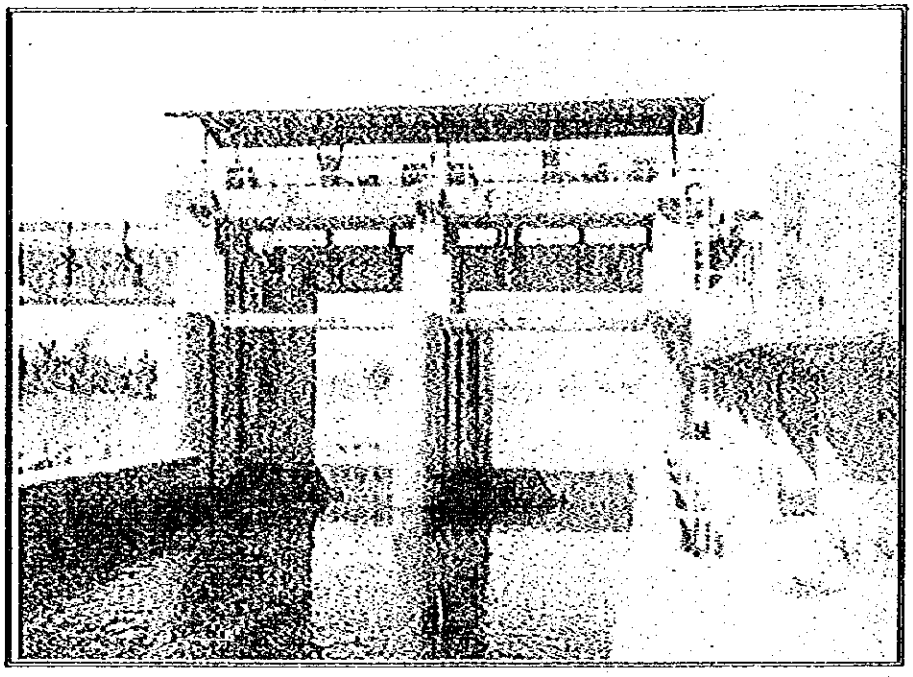

Photo No.1 - Existing irrigation diversion dam at Papa River.

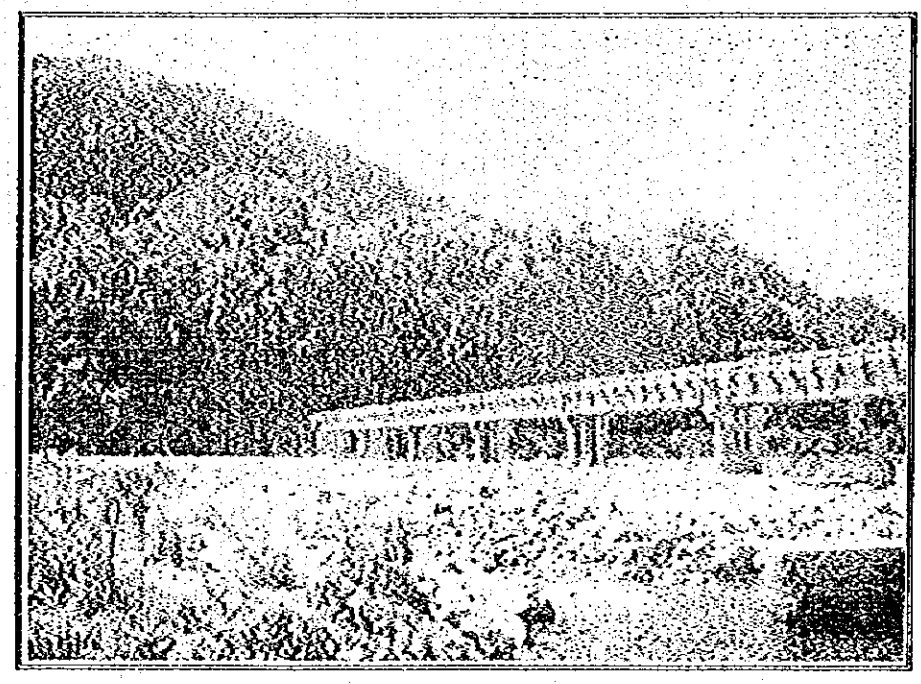

Photo No.2 - Papa River has a very small flow during summer.
Proposed Papa Sabo Dam is upstream of this structure.

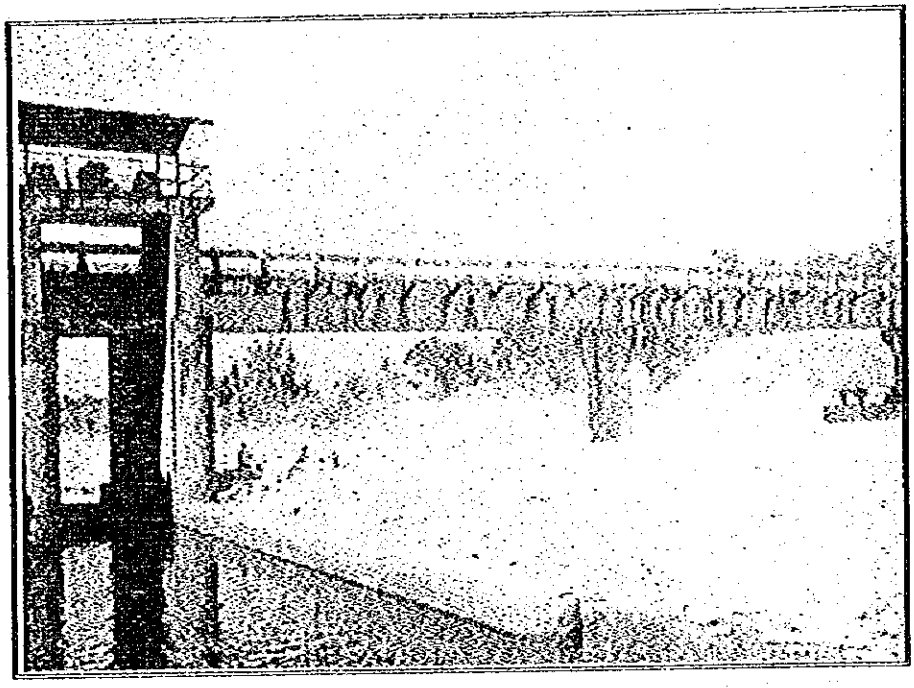

Photo No.3 - Existing irrigation diversion dam at Solsona River.

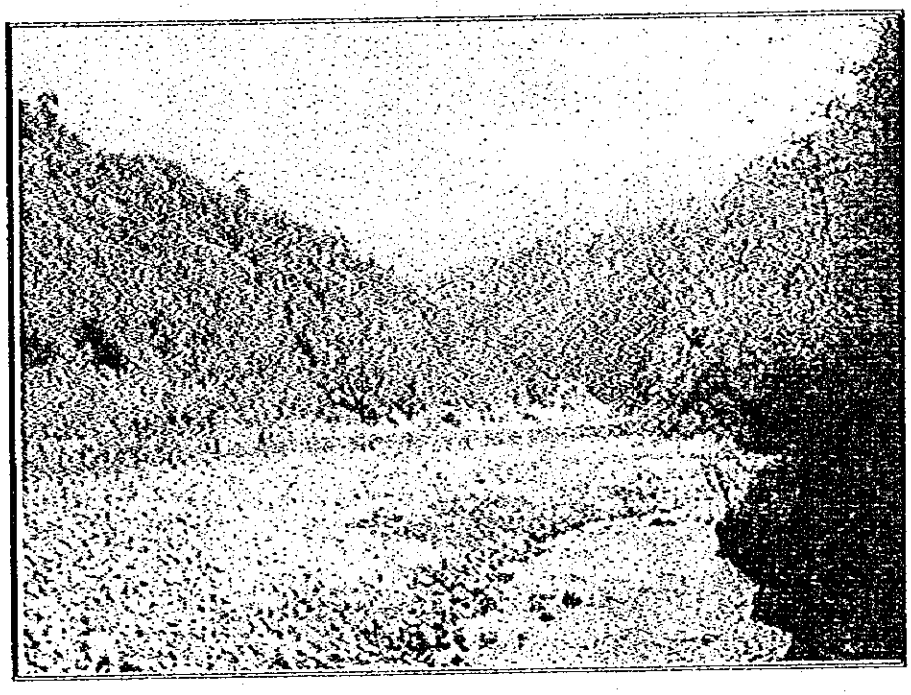

Photo No.4 - Solsona River has a very small flow during summer. The proposed Solsona Sabo Dam No.1 will be upstream of the existing irrigation diversion dam.

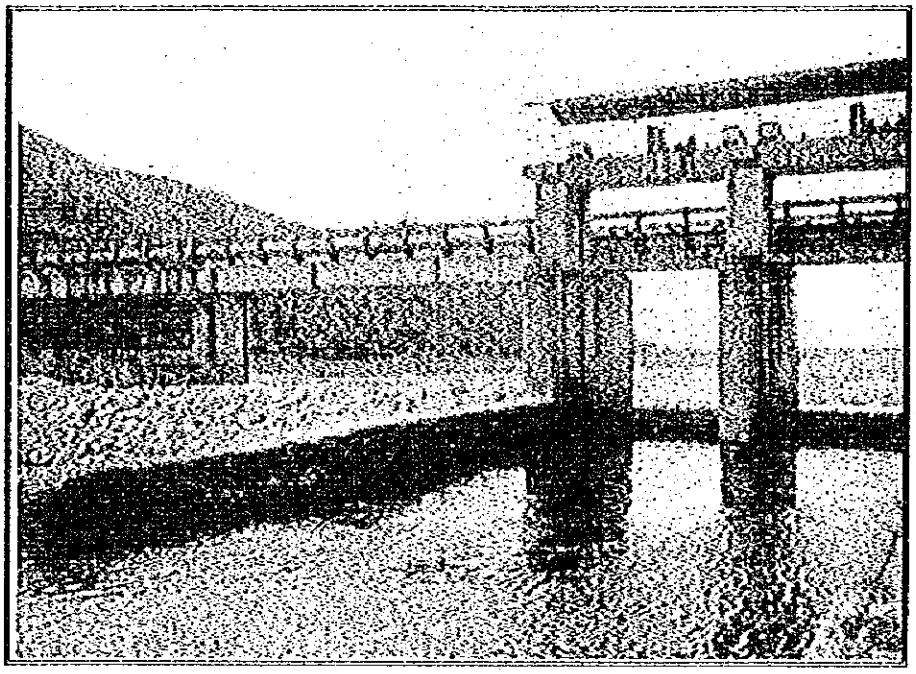

Photo No.5 - Existing irrigation diversion dam at Madongan River.

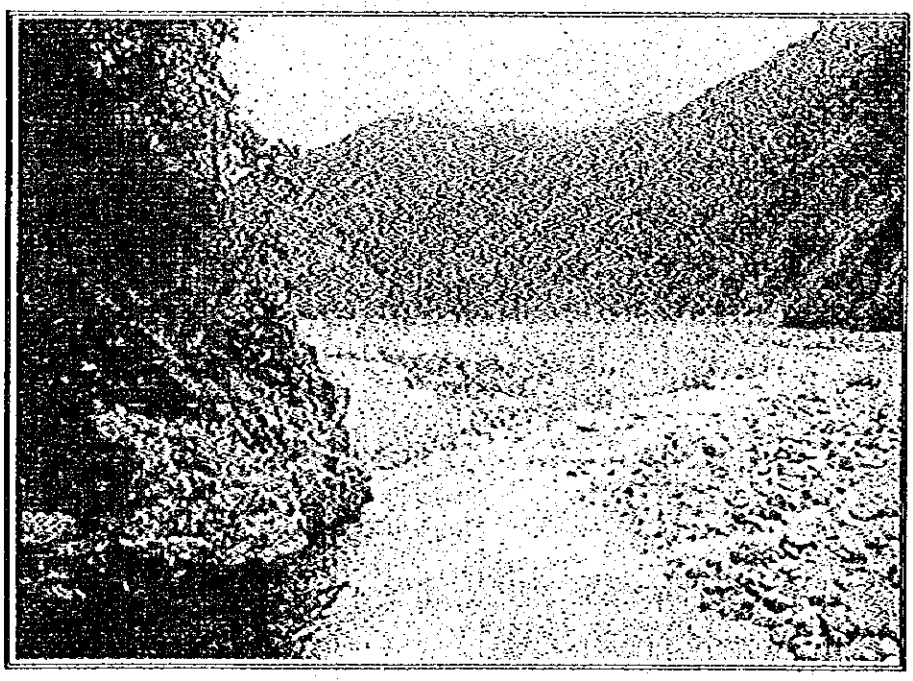

Photo No.6 - Madongan River has a very small flow during summer. The proposed Madongan Sabo Dam will be upstream of the existing irrigation diversion dam.

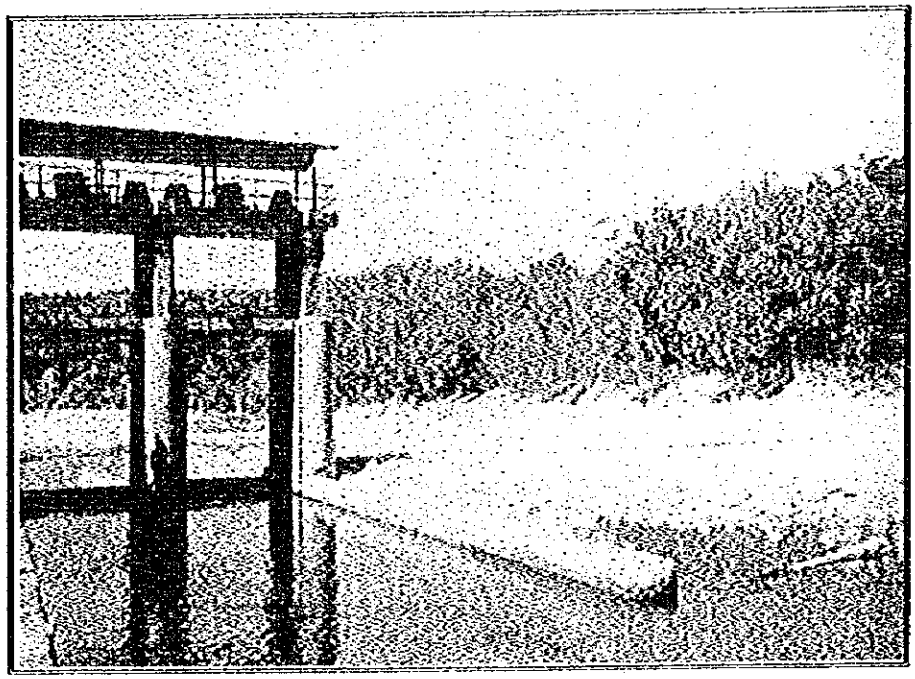

Photo No.7 - Existing irrigation diversion dam at Labugaon River.

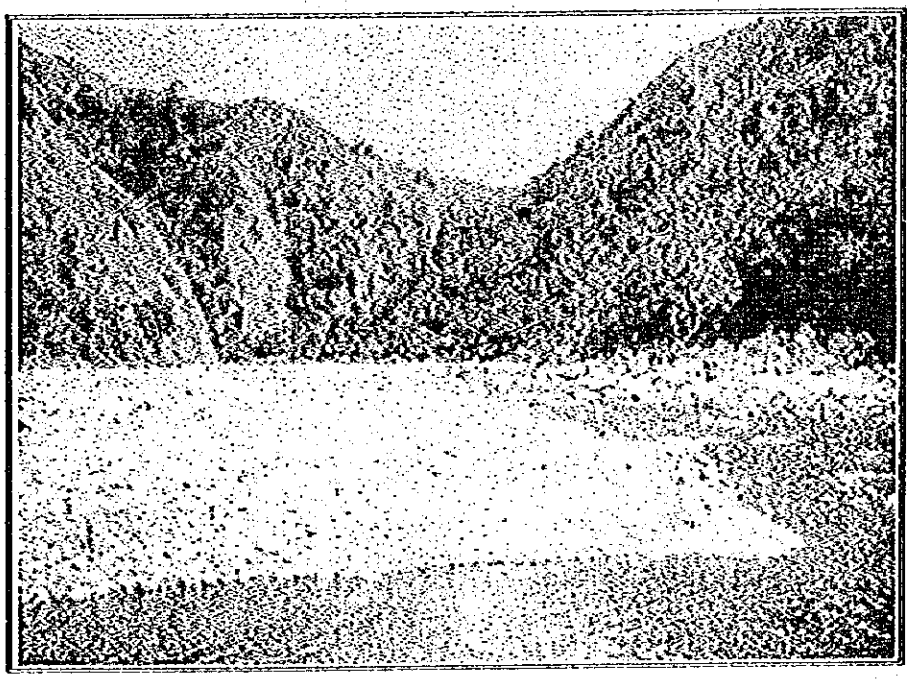

Photo No.8 - Labugaon River has a very small flow during summer. The proposed Labugaon Sabo Dam No.1 will be upstream of the existing irrigation diversion dam.

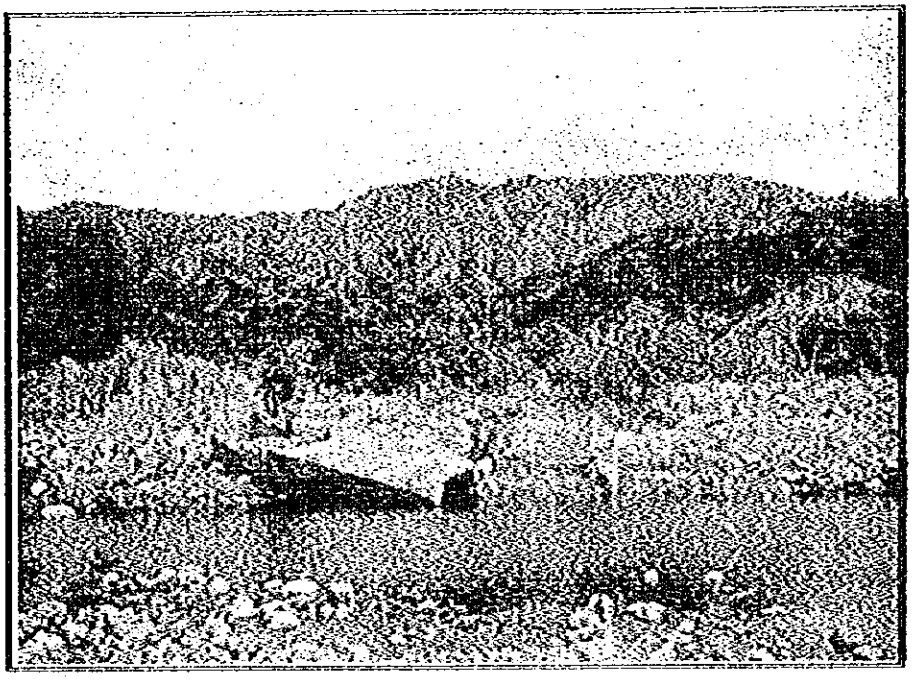

Photo No.9 - Destroyed old irrigation intake at Cura River.

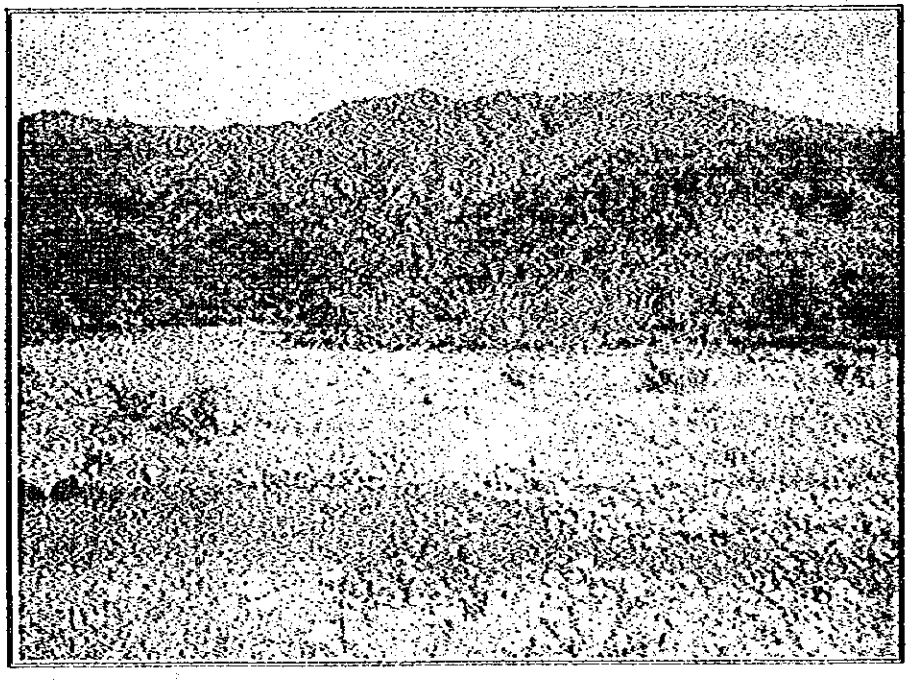

Photo No.10 - Cura River has a very small flow during summer. The proposed Cura Sabo Dam No.1 will be upstream of the existing irrigation intake structure.

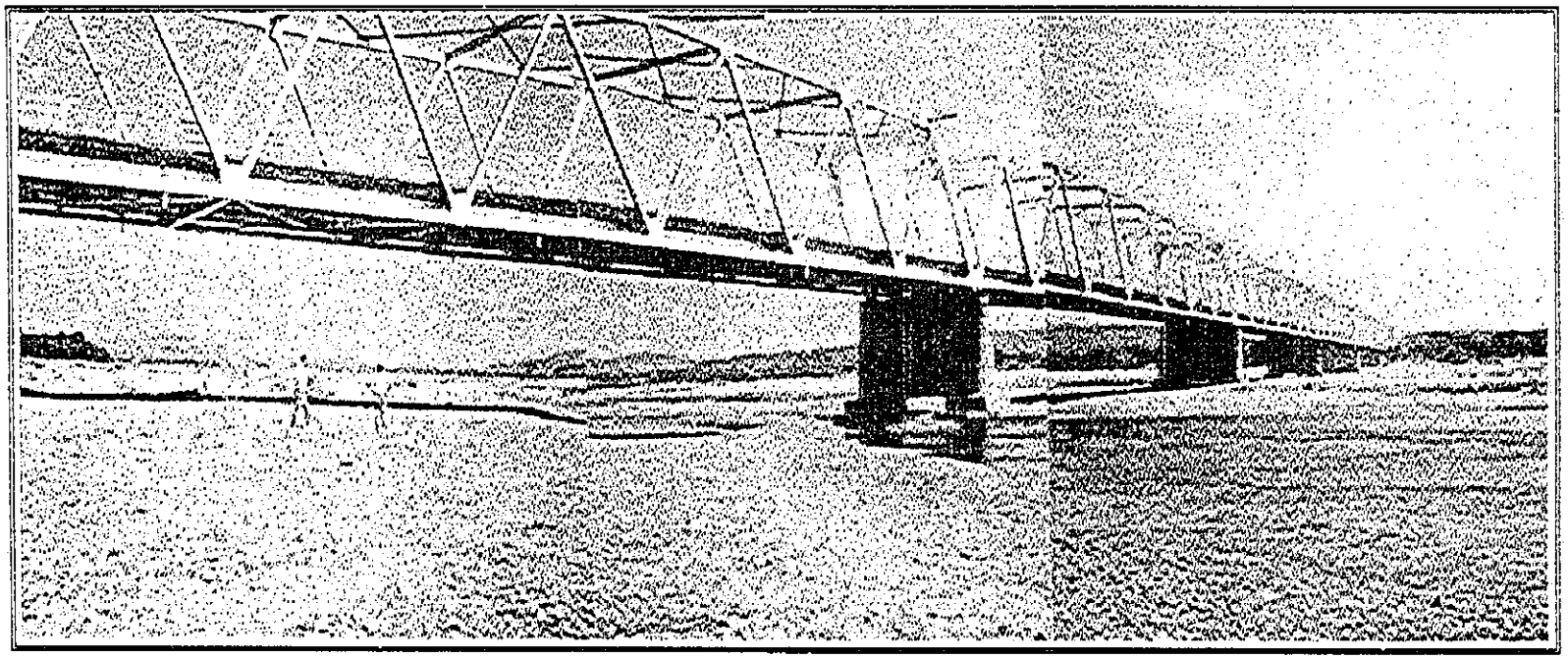

Photo No. 11

A wide view of the Cauplasan Bridge Area at Bongo River. Notice the widening river channel and the large amount of sediment deposits. This bridge is under threat by the large amount of sediments during big floods.

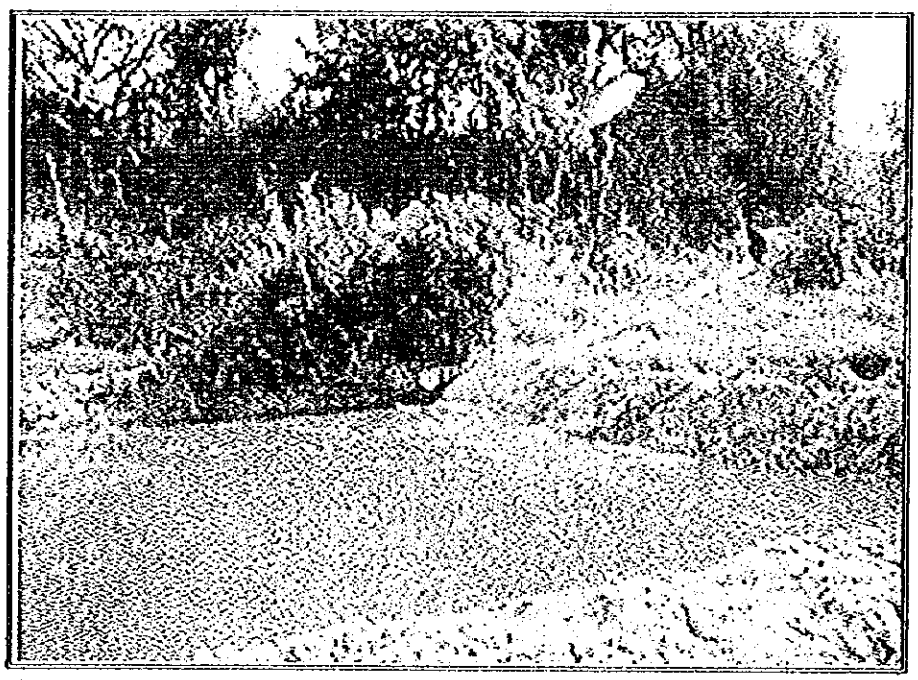

Photo No.12 - Wastewater impounding lagoon of an industrial facility along the dry riverbed of Laoag River.

Photo No.13 - Crops are planted by farmers at the dry beds of the Laoag River during summer.

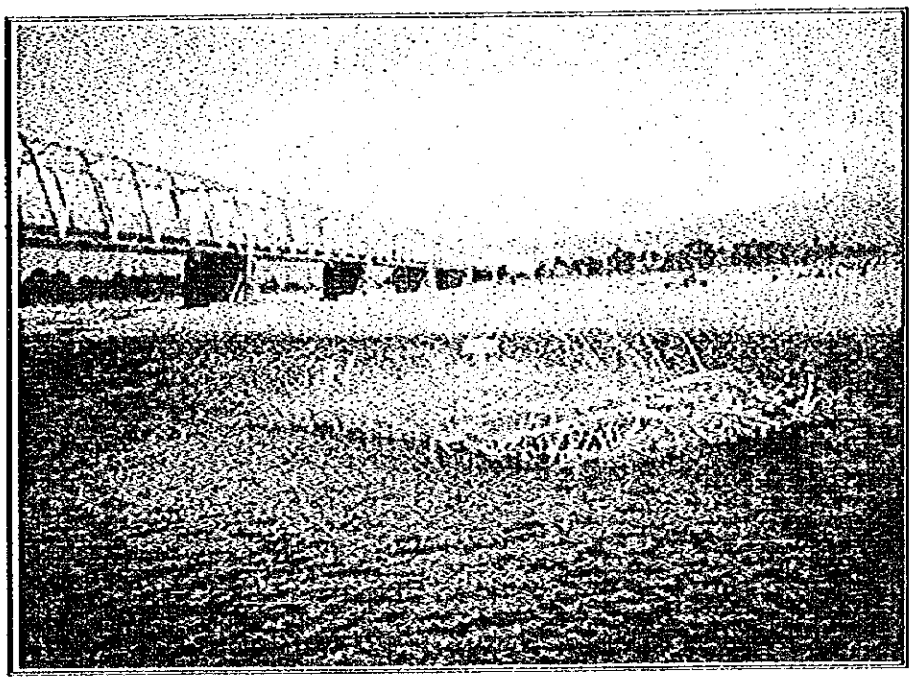

Photo No.14 - Typical fish shelter in the rivers used by farmers to catch fish during summer.

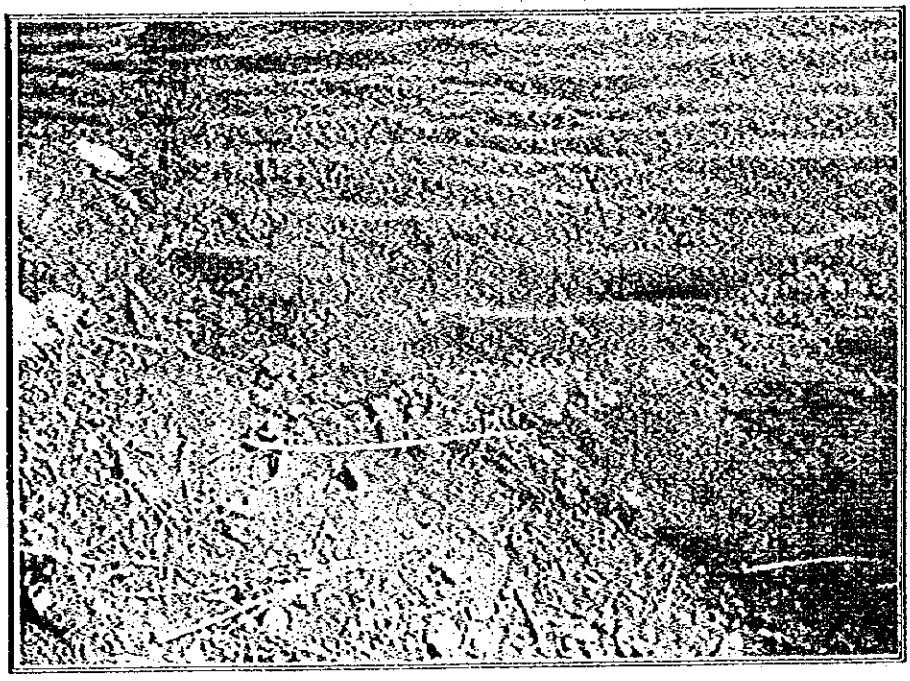

Photo No.15 - Algal growths are present during summer in the Laoag River near Gilbert Bridge.

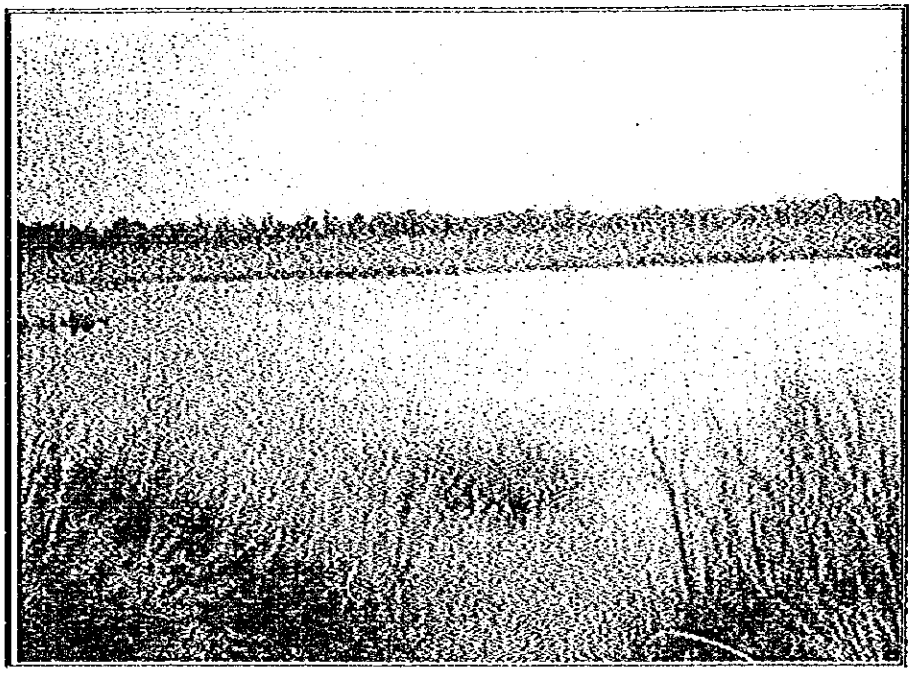

Photo No.16 - Location of a water quality sampling station of the Laoag River at Barangay Suyo.

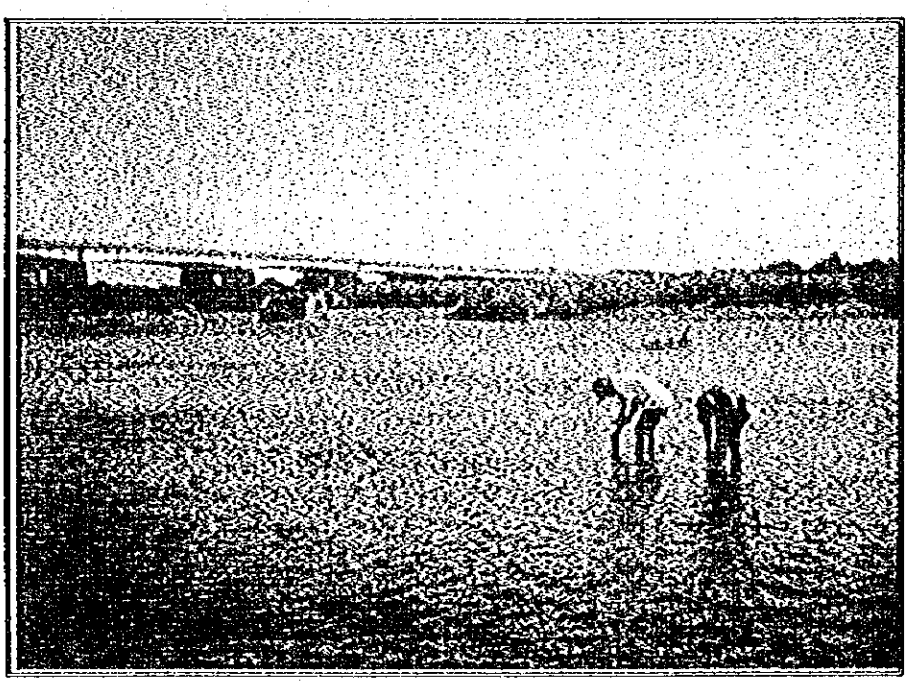

Photo No.17 - On-site measurements of some water quality parameters of the Laoag River near Gilbert Bridge.

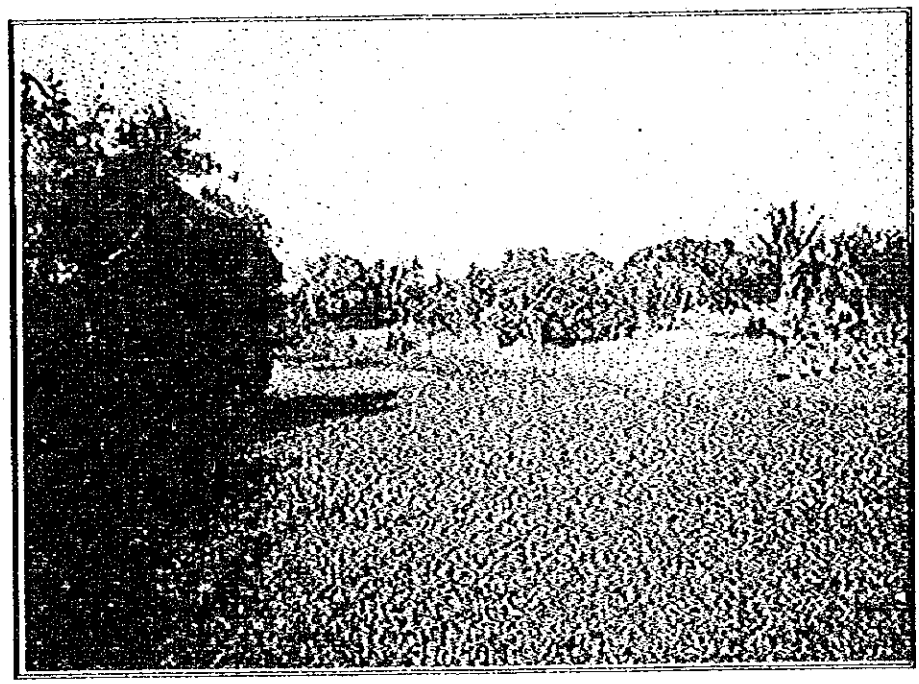

Photo No.18 - Downstream sections of Daorao Creek are typically populated by floating vegetation.

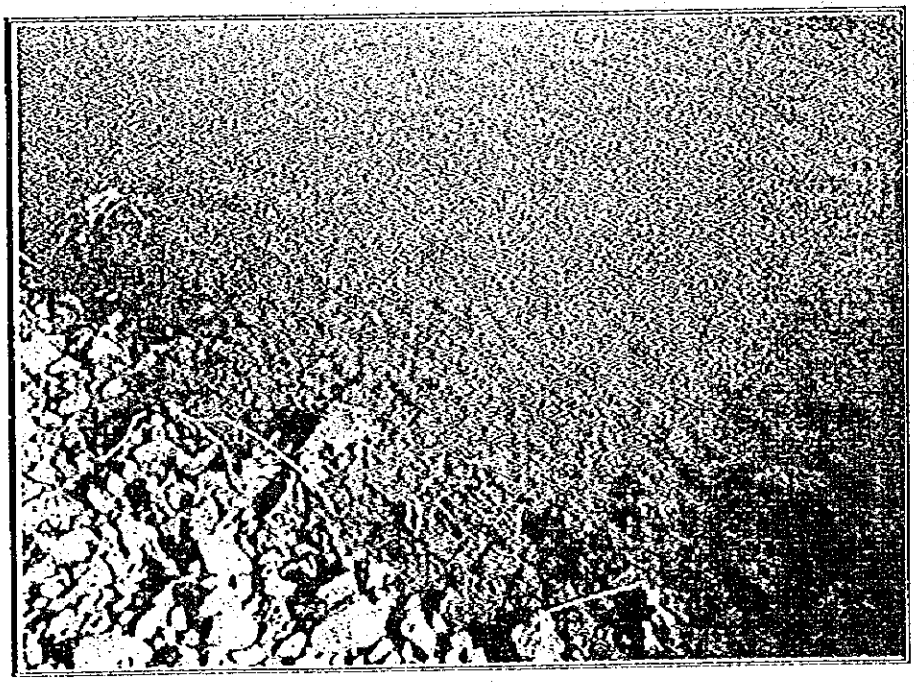

Photo No.19 - Visual quality of the Daorao Creek water is very poor.

APPENDIX G

PROCESS DOCUMENTATION REPORT

For The

SCOPING AND PUBLIC CONSULTATION

EXECUTIVE SUMMARY

This **PROCESS DOCUMENTATION REPORT** refers to the scoping and public consultation activities for the Environmental Impact Assessment (EIA) Study of the Phase I Priority Projects on the proposed flood control system in the Laoag River Basin. This is in conformance with the requirements under the revised rules and regulations for the EIS System embodied by DENR's DAO No.37 series of 1996. It is part of the EIS document in the application for an Environmental Compliance Certificate (ECC) of the proposed five sabo dams, seven river improvement works, and the urgent improvement works for the Laoag City Urban Drainage System.

This report documents the various activities conducted by the project proponent concerning public information, scoping sessions, and public consultations. Both formal and informal public information were made during the conduct of the flood damage survey. Informal meetings with the Barangay Captains were initiated by the EIA Study Team during the conduct of the socioeconomic and perception surveys at selected barangays which are part of the areas heavily affected by previous floods. A scoping session was conducted last 13 February 1997 with the Provincial Environment and Natural Resources Office (PENRO) of the DENR at Laoag City, while a separate discussion was made last 24 February 1997 with DENR's Region I Office in San Fernando, La Union.

The public consultation meeting held at the Laoag ampitheater last 30 May 1997 showed that the people accepted the project since it is a welcome relief to the annual flooding problem. After all the issues were resolved/discussed, the DPWH officials asked the participants if they have any fears or apprehensions regarding the various structures to be constructed under the proposed project. The people did not express any fears nor interpose any objection to the proposed structures. In addition, the consultants further explained that there is really no cause for alarm since the proposed structures are for flood prevention and the proposed Sabo dams are very small dams whose effective heights are between four to ten meters.

1.0 INTRODUCTION

This report is prepared in compliance with the latest requirements of the Department of Environment and Natural Resources (DENR) concerning the preparation of an Environmental Impact Statement (EIS). It documents the public participation and social acceptability aspects of the proposed project. These aspects will determine whether the public is convinced that the overall consequence of the project is beneficial to most people, directly or indirectly, affected by it.

1.1 DAO 96-37

The Philippine EIS System is based on a series of presidential decrees, executive orders, proclamations, letters of instruction, and implementing rules and regulations. Prominent of these are Presidential Decree (PD) 1586 and Proclamation 2146. The previous revision to the implementing rules and regulations of PD 1586 was DENR Administrative Order (DAO) No.21 series of 1992 which provided the set of procedures for the whole process of securing an Environmental Compliance Certificate (ECC). This set of procedures has recently been replaced by DAO No.37 series of 1996 (cited as DAO 96-37) which become effective last January 1997.

DAO 96-37 gives higher importance on public participation and social acceptability in the processing of ECC applications. Public participation is giving citizens the opportunity to influence major decisions that affect them. Its goal is to enable the people to take responsibility for environmental protection and management through active involvement in decision making. DENR believes that public participation is the only process to promote and acquire social acceptability of a proposed project. It will reduce the level of misinformation and distrust. In addition, it will help identify the concerns of affected groups and help focus the planning activities on issues of concern. This is expected to result in an improve decision-making process.

1.2 Background of the Study

The proposed plan on sabo and flood control in the Laoag River Basin is an outcome of the request for technical assistance by the Government of the Philippines (GOP) from the Government of Japan (GOJ) in 1992. Consequently, the Japan International Cooperation Agency (JICA) made a preparatory survey. The implementing arrangement for technical assistance was agreed upon last November 1995 between the Department of Public Works and Highways (DPWH) of the GOP and the JICA. The JICA Study Team was dispatched to the Philippines on 24 March 1996 for carrying out the study.

The Basin suffers from annual flood and sediment damages caused by typhoons. Recent typhoons caused serious damages to the basin. Typhoon Maring in 1992 affected an estimated 71,000 people and inundated Laoag City with a water depth of 1.0 to 1.5 meters. Hence, sabo dams and river improvement works are necessary to provide protection to the inundation areas.

The EIS which is the subject of the ECC application, covers only the Phase I priority projects of the proposed plan on sabo and flood control in the Laoag River Basin. These project components are described in Section 1.3.

1.3 Project Description

The proposed project is part of the master plan to provide adequate flood protection for a significant portion of the Laoag River Basin.

Goal and Objectives

The main objective of the proposed project is to provide adequate protection against the annual flooding in the Laoag River Basin. The protection should be able to withstand a flood with a return period of 25 years (cited as "25-year" flood).

Rationale

Project rationale is based on the idea that the reduce risk of flooding will encourage economic development and improve the quality of life in the Laoag River Basin. It is obvious that the project has far-reaching benefits beyond the direct benefit of providing flood protection.

A 5-year flood in the Laoag River Basin can inundate some 14,800 hectares and affect a population of 46,400 with damages estimated to reach some 361 million pesos (at 1996 prices). Although a 25-year flood will only inundate an additional 17% of the area covered by a 5-year flood, the damages will be twice that of the 5-year flood. This points out the necessity of protecting the area against a 25-year flood.

Project Area and Location

The project area is the Laoag River Basin covering an area of 1,332 km² located in the province of Ilocos Norte. It includes Laoag City and 10 municipalities. However, only the towns of San Nicholas, Sarrat, Dingras, and Solsona are thoroughly included in the basin, while the other towns are partly covered. The Basin covers approximately 40 percent of the total provincial land with an estimated population of 259,000. A general map of the basin is presented in Figure A.1 of the annexes.

Project Components

The proposed project is the Phase I Priority Projects of the proposed plan on sabo and flood control in the Laoag River Basin. The overall master plan will be implemented in three phases. However, this project, which is the subject of the ECC application, covers only the Phase I. This include five sabo dams, seven river improvement works, and the urgent improvement works for the Laoag Urban Drainage System as indicated in Figure A.2 of the annexes.

Project Activities

Construction activities are the usual activities associated with earthworks and horizontal concreting projects. These activities include: (1) site clearing, (2) excavation, (3) temporary access road construction, and (4) concreting. Except for cement, construction materials for the concrete structures are readily available in the site. Concrete volume requirement for the sabo dams ranges from 9,600 m^3 to 18,500 m^3. Thickness of the dam aprons ranges from 0.9 m to 2.0 m.

Operation and maintenance will not be a problem since the project components are all passive structures. The activities during this phase will focus on the periodic inspection of all structures to insure the early detection of any problems. Structural integrity of the concrete structures will be a primary concern.

Although project abandonment is quite remote, any abandonment decision in the future can easily be carried out since the project's construction materials are only concrete, steel, and aggregates. There will be no decontamination activities since toxic and hazardous wastes will not be present.

2.0 PUBLIC INFORMATION

Since the start of the study, the public was informed both formally and informally. Instances where project information was dessiminated include: (1) the project presentation, (2) flood damage survey, and (3) socioeconomic and perception survey. In addition, DPWH has requested the cooperation of the Provincial Government on the conduct of the study for the proposed project through a letter to the Governor of Ilocos Norte dated 11 June 1996. A copy of the said letter is presented in the annexes.

2.1 Project Presentation

The DPWH and the JICA Study Team presented the progress of the study last 13 September 1996 at the Texicano Hotel, Laoag City, Ilocos Norte. Various government agencies were invited for consultations. Representatives of the following offices have attended: Laoag City Engineer, Provincial Engineer, DPWH Engineering Districts, National Irrigation Administration (NIA), DENR's Ilocos Norte PENRO Office, and the Provincial Planning and Development Office (PPDO).

2.2 Flood Damage Survey

Informal public information activities regarding the proposed project were conducted by the DPWH and the JICA Study Team during the detailed flood damage survey. Interviews were made with all barangay captains in the flood prone areas. Everytime the team visits a barangay, a brief project presentation was made in the informal meetings. It was explained to the people that the proposed project will use dikes for the flood control of the Laoag River including its tributaries and sabo dams for controlling the excessive sediment runoff in the downstream reaches of the various rivers. The flood damage survey was conducted for the estimation of probable flood damage in the Laoag River Basin. Data were obtained regarding the flood area, flood depth, affected population, and inventory of existing assets in the flood-prone area.

2.3 Socioeconomic and Perception Surveys

Another set of informal meetings were initiated by the EIA Study Team during the conduct of the socioeconomic and perception surveys. Meetings were held with the Barangay Captains of the surveyed areas. The selected barangays are part of the areas heavily affected by previous floods. Again, it was explained during these meetings that the proposed project will use dikes for the flood control of the Laoag River including its tributaries and sabo dams for controlling the excessive sediment runoff in the downstream reaches of the various rivers.

In addition, the consultants clearly explained that the Sabo dams are for capturing the

sediments and are very small dams whose effective heights are between four to ten meters and with design volumes between 390,000 to 2,190,000 m^3. The consultants further explained that there is really no cause for alarm since the proposed structures are for flood prevention.

The people were very happy about the proposed project and revealed their aspiration of someday getting a relief from the disastrous annual flooding. Around 90% of the households in the surveyed barangays have experienced the flood in 1996 with an average flood water depth of 0.8 meter in front of each house that lasted an average of 3.8 days.

3.0 INITIAL SCOPING

An initial scoping session was conducted last 13 February 1997 with the Provincial Environment and Natural Resources Office (PENRO) of the DENR at Laoag City, while a separate discussion was made last 24 February 1997 with DENR's Region I Office in San Fernando, La Union. The purpose of the sessions was to get DENR's concerns which should be addressed by the EIA study and to be included in the EIS.

3.1 Issues and Concerns

The PENRO staff raised the following items during the discussions: (1) schedule of the required community consultations, (2) clear presentation of the socio-economic data, (3) identification of employment opportunities for the local workers during the actual implementation of the project, (4) clear presentation of the various engineering information to be used for the design of the proposed sabo dams, (5) the project proponent should show that the proposed project will not cause an unacceptable erosion of the rivers, (6) clear presentation of the resulting situation in the event of a dam failure, and (7) identification of the various areas to be protected by the proposed project.

The regional office is happy that a project to protect the people of the frequently flooded Laoag Basin will be implemented. According to the EIA Section Chief, the Regional Technical Director (RTD) has decided that the ECC application for this project will be processed in the regional office. However, the regional office requires that the project proponent should properly inform the affected population and should consider any valid issues or concerns that they will raise.

Discussions with the PENRO and Region I offices showed that DENR is very much interested in the conduct of the community meeting since this will be part of the proofs for a transparent community-based process of public participation. DENR believes that the meeting will improve the social acceptability of the project and will pave the way for a smooth project implementation in the future.

3.2 Identification of Stakeholders

Stakeholders, as defined by DAO-96-37, are persons who may be significantly affected by the project or undertaking, such as, but not limited to, members of the local community, local government units, non-government organizations, and people's organizations.

The major stakeholders are the people living in the areas to be protected against the annual flooding. Since the project is basin wide in scope, the local government units are therefore the representative of the stakeholders. Concerned government agencies are also stakeholders such as NIA, PPDO, DENR, and NEDA.

3.3 Scoping Matrix

Potential significant environmental issues (SEIs) were identified using a scoping matrix presented in Table G.1. Major SEIs are identified to be beneficial in nature. This is not surprising since the proposed project is actually a mammoth mitigating measure against the annual adverse impacts of a natural hazard (which is flooding) that is causing havoc on the people and economy of the Laoag River Basin. SEIs with expected major beneficial impacts are identified to occur during the operation phase.

Table G.1

SCOPING MATRIX FOR IDENTIFYING POTENTIAL SIGNIFICANT ENVIRONMENTAL ISSUES (SEIs)

ENVIRONMENTAL ATTRIBUTES		ACTIVITIES AND SOURCES OF IMPACTS													
		Construction Phase								Operation Phase					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
PHYSICAL RESOURCES	1) Meteorology														
	2) Air Quality and Noise	+	○	○	○	○			+						
	3) River Hydraulics	○			○	○				▲	▲	○	○		▲
	4) River Water Quality	+			+	●	+			+	+	●	●		
	5) Terrain/Soils/Groundwater	○		○											
	6) Oceanography														
ECOLOGICAL RESOURCES	7) Terrestrial Flora/Fauna	○		○											
	8) Marine/Estuarine Flora/Fauna														
HUMAN USE VALUES	9) Land Use Patterns														▲
	10) Land Transportation														+
	11) Water Supply													+	
	12) Power Usage														
	13) Housing														▲
	14) Industrial Pollution														
	15) Mineral Resources														
	16) River Fisheries	○			○		○			○	▲	○	○		
	17) River Navigation														
QUALITY OF LIFE VALUES	18) Socioeconomics				○			○						+	▲
	19) Public Health/Safety	+						+	+	▲					▲
	20) Aesthetics/Recreation/Tourism									+					
	21) Cultural/Historic/Archaeologic														

ACTIVITIES AND SOURCES OF IMPACTS

1 - Site Preparation (clearing/earthworks)
2 - Transport of Construction Materials
3 - Construction of Temporary Access Roads
4 - Construction of Sabo Dams
5 - Construction of River Improvement Works
6 - Sand/Gravel Extraction for Concreting Works
7 - Construction Work Force
8 - Operation of Heavy Equipment

9 - Presence/Maintenance of Structures
10 - Trapping of Sediments
11 - Water Retention of Sabo Dam
12 - Inundation at Sabo Dam Sites
13 - Additional Irrigation Water
14 - Control of Flood

Expected Magnitudes of Potential Impacts

▲ - Major Positive Impact
■ - Major Negative Impact
+ - Minor Impact
○ - Negligible Impact

Note: Minor and negligible impacts could be either adverse of beneficial