TABLE A.2 ALTERNATIVE DISBURSEMENT SCHEDULE

(Unit : 1,000 Bs.)

Item	Implementation		Amount	Year									
				2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Chane - Pailon Area Toal		Total	698,584	538	37,135	26,615	87,847	87,847	76,800	107,922	107,930	133,010	32,945
		L/C	266,638	108	13,140	9,132	34,172	34,172	29,774	40,957	40,848	51,373	12,970
		F/C	431,946	430	23,995	17,483	53,675	53,675	47,026	66,965	67,082	81,637	19,975
Chane Area		Total	234,627	0	0	2,040	82,120	82,120	68,349	0	0	0	0
		L/C	91,434	0	0	408	32,002	32,002	27,023	0	0	0	0
		F/C	143,193	0	0	1,632	50,118	50,118	41,326	0	0	0	0
Rio Chane River Improvement	Department	Total	234,627	0	0	2,040	82,120	82,120	68,349	0	0	0	0
		L/C	91,434	0	0	408	32,002	32,002	27,023	0	0	0	0
		F/C	143,193	0	0	1,632	50,118	50,118	41,326	0	0	0	0
Pailon Area		Total	374,157	0	0	114	1,819	1,819	4,404	103,456	103,883	129,102	29,559
		L/C	143,084	0	0	23	738	738	1,269	39,321	39,366	49,941	11,690
		F/C	231,073	0	0	91	1,081	1,081	3,135	64,135	64,517	79,161	17,869
Rio Pailon Downstream River Improvement	Department	Total	289,645	0	0	0	0	0	2,519	101,376	101,376	84,374	0
		L/C	109,932	0	0	0	0	0	504	38,477	38,477	32,476	0
		F/C	179,713	0	0	0	0	0	2,015	62,899	62,899	51,898	0
Rio Pailon Upstream River Improvement	Department	Total	54,979	0	0	0	0	0	0	0	478	32,988	21,514
		L/C	21,942	0	0	0	0	0	0	0	95	13,165	8,681
		F/C	33,037	0	0	0	0	0	0	0	383	19,823	12,833
Rancha Chico Drainage Improvement	Department	Total	8,113	0	0	0	0	0	0	0	70	4,868	3,174
		L/C	2,895	0	0	0	0	0	0	0	14	1,737	1,144
		F/C	5,218	0	0	0	0	0	0	0	56	3,131	2,030
El Chaco Drainage Improvement	Department	Total	1,118	0	0	0	0	0	0	0	10	671	437
		L/C	406	0	0	0	0	0	0	0	2	243	161
		F/C	712	0	0	0	0	0	0	0	8	428	276
El Empalme II Drainage Improvement	Department	Total	7,304	0	0	0	0	0	0	0	64	4,382	2,858
		L/C	2,637	0	0	0	0	0	0	0	13	1,582	1,042
		F/C	4,667	0	0	0	0	0	0	0	51	2,800	1,816
Pailon Area Secondary Drainage	Warnes Municipality	Total	12,998	0	0	114	1,819	1,819	1,885	2,080	1,885	1,819	1,576
		L/C	5,272	0	0	23	738	738	765	844	765	738	662
		F/C	7,726	0	0	91	1,081	1,081	1,120	1,236	1,120	1,081	914
Okinawa Area		Total	89,800	538	37,135	24,461	3,908	3,908	4,047	4,466	4,047	3,908	3,386
		L/C	32,120	108	13,140	8,701	1,432	1,432	1,482	1,636	1,482	1,432	1,280
		F/C	57,680	430	23,995	15,760	2,476	2,476	2,565	2,830	2,565	2,476	2,106
Okinawa Main Drainage Improvement	Department	Total	61,891	538	37,135	24,219	0	0	0	0	0	0	0
		L/C	21,899	108	13,140	8,653	0	0	0	0	0	0	0
		F/C	39,992	430	23,995	15,566	0	0	0	0	0	0	0
Okinawa Area Secondary Drainage	Okinawa Municipality	Total	27,909	0	0	242	3,908	3,908	4,047	4,466	4,047	3,908	3,386
		L/C	10,221	0	0	48	1,432	1,432	1,482	1,636	1,482	1,432	1,280
		F/C	17,688	0	0	194	2,476	2,476	2,565	2,830	2,565	2,476	2,106
San Juan - Antofagasta Area Total		Total	207,912	3,907	18,650	18,268	16,584	15,942	20,539	37,903	33,793	33,932	8,412
		L/C	86,714	1,945	9,181	8,133	6,554	6,436	8,559	15,820	13,961	13,136	3,001
		F/C	121,198	1,962	9,469	10,135	10,030	9,506	11,980	22,083	19,832	20,796	5,411
San Juan Area		Total	107,550	763	3,642	6,921	11,586	10,944	13,064	21,229	20,915	16,101	2,394
		L/C	45,724	520	2,453	3,216	4,505	4,387	5,487	8,997	8,825	6,480	860
		F/C	61,826	243	1,189	3,705	7,081	6,557	7,577	12,232	12,090	9,621	1,534
A. Yapacanicito River Improvement	Department	Total	37,350	0	0	0	0	0	4,698	13,073	13,073	6,509	0
		L/C	16,169	0	0	0	0	0	2,055	5,659	5,659	2,797	0
		F/C	21,181	0	0	0	0	0	2,643	7,414	7,414	3,712	0
San Juan Main Drainage Improvement (1)	Department	Total	8,474	0	0	1,066	5,085	2,323	0	0	0	0	0
		L/C	3,097	0	0	393	1,858	845	0	0	0	0	0
		F/C	5,377	0	0	673	3,227	1,478	0	0	0	0	0
San Juan Main Drainage Improvement (2)	San Carlos Municipality or Local Group	Total	14,136	0	0	0	1,838	3,958	3,536	2,828	1,978	0	0
		L/C	5,924	0	0	0	764	1,659	1,482	1,186	835	0	0
		F/C	8,212	0	0	0	1,074	2,299	2,054	1,642	1,143	0	0
A. Tejeria Drainage Improvement	Department	Total	8,215	0	0	0	0	0	0	0	1,034	4,929	2,254
		L/C	2,999	0	0	0	0	0	0	0	381	1,800	820
		F/C	5,216	0	0	0	0	0	0	0	653	3,129	1,434
Road-cum-embankment	Department	Total	6,071	763	3,642	1,667	0	0	0	0	0	0	0
		L/C	4,088	520	2,453	1,116	0	0	0	0	0	0	0
		F/C	1,983	243	1,189	551	0	0	0	0	0	0	0
San Juan Area Secondary Drainage	San Carlos Municipality	Total	33,304	0	0	4,188	4,663	4,663	4,830	5,328	4,830	4,663	140
		L/C	13,447	0	0	1,707	1,883	1,883	1,950	2,152	1,950	1,883	40
		F/C	19,857	0	0	2,481	2,780	2,780	2,880	3,176	2,880	2,780	100
Antofagasta Area		Total	100,362	3,144	15,008	11,347	4,998	4,998	7,475	16,674	12,878	17,831	6,018
		L/C	40,990	1,425	6,728	4,917	2,049	2,049	3,072	6,823	5,136	6,656	2,141
		F/C	59,372	1,719	8,280	6,430	2,949	2,949	4,403	9,851	7,742	11,175	3,877
A. Jochi River Improvement	Department	Total	25,010	3,144	15,008	6,859	0	0	0	0	0	0	0
		L/C	11,211	1,425	6,728	3,059	0	0	0	0	0	0	0
		F/C	13,799	1,719	8,280	3,800	0	0	0	0	0	0	0
A. Tacuaral River Improvement	Department	Total	18,272	0	0	0	0	0	2,300	10,964	5,013	0	0
		L/C	7,470	0	0	0	0	0	950	4,483	2,040	0	0
		F/C	10,802	0	0	0	0	0	1,350	6,481	2,973	0	0
Antofagasta Main Drainage Improvement	Department	Total	21,389	0	0	0	0	0	0	0	2,690	12,833	5,867
		L/C	7,679	0	0	0	0	0	0	0	974	4,607	2,098
		F/C	13,710	0	0	0	0	0	0	0	1,716	8,226	3,769
Antofagasta Area Secondary Drainage	San Carlos Municipality	Total	35,691	0	0	4,488	4,998	4,998	5,175	5,710	5,175	4,998	151
		L/C	14,630	0	0	1,858	2,049	2,049	2,122	2,340	2,122	2,049	43
		F/C	21,061	0	0	2,630	2,949	2,949	3,053	3,370	3,053	2,949	108
Ground Total		Total	906,496	4,445	55,785	44,883	104,431	103,789	97,339	145,825	141,723	166,942	41,357
		L/C	353,352	2,053	22,321	17,265	40,726	40,608	38,333	56,777	54,809	64,509	15,971
		F/C	553,144	2,392	33,464	27,618	63,705	63,181	59,006	89,048	86,914	102,433	25,386

CHAPTER 11

PROJECT EVALUATION

CHAPTER 11 PROJECT EVALUATION

11.1 General

The Project Area covers 1,207 km^2, consisting of the Chane-Pailon project with 600 km^2 and the San Juan-Antofagasta project with 607 km^2. The former is divided into three sub-projects of Rio Chane, Rio Pailon and Okinawa Drainage, and the latter is composed of two sub-projects of San Juan and Antofagasta.

Subjects of the project evaluation are the two projects of Chane-Pailon and San Juan-Antofagasta and each of the said five sub-projects. The evaluation is mainly carried out from economic point of view, taking financial aspect and social- and natural-environmental impacts into account.

11.2 Economic Evaluation

The economic evaluation is indicated by the Economic Internal Rate of Return (EIRR), Benefit-Cost Ratio (B/C) and Net Present Value (NPV), by using the present values of economic cost and economic benefit of the project. The economic prices, which are required to estimate the economic cost and benefit, are given under the conditions and assumptions as follows:

(1) Transfer payments such as value-added tax, income tax and corporation tax are not included in the economic cost and benefit,

(2) Standard Conversion Factor (SCF) to be applied for the calculation of the economic prices of non-trade goods and services is assumed to be 88 %, based on the amount and duties of the external trade of Bolivia in recent years,

(3) Opportunity cost of wages for unskilled labors is taken as 80 % of their market prices, taking the unemployment rate of Bolivia into account,

(4) Opportunity cost of land to be acquired for the project is assumed to be 70 %, taking into consideration the existing situation of land use in the objective areas,

(5) Inflation factor is taken no account for the economic evaluation.

Economic life of the project is taken as 30 years after the construction of facilities was completed, and the benefit and the operating and maintenance cost of the facilities are assumed to occur every year during the period of project life.

11.2.1 Economic Benefit

(1) Concept of Flood Control Benefit

The economic benefit of a flood control project could be presented as an expected reduction effect in flood damage by implementing the project, that is, a difference between two damages of with-project and without-project situations.

The benefit is estimated dividing into two stages; in the first stage the direct effect of reduction in damage to assets in the inundated area, and in the second stage the reduction effect in damage to public facilities and economic activities as a function of the damage to assets.

(2) Estimates of Flood Damage

For the purpose of estimating the economic benefit, a flood damage analysis would be made to assets, which are composed of general assets (buildings and household effects) and agricultural field crops, using results of a flood damage survey.

The flood damages to the general assets could be estimated by using (a) number of the assets to be inundated by flood, (b) appraisal values of the assets, and (c) damage rate of the assets inundated.

The damages to agricultural field crops could be estimated by using (a) inundation areas in the agricultural crop fields, (b) production per unit area, and (c) the damage rate of agricultural field crops inundated.

In the inundation area, major buildings include residential houses (high, medium, and low classes), shops, schools, factories, health centers, etc., and agricultural crop fields are mainly composed of soybeans, rice, sugar cane, maize and others. The inundation area has been prepared in accordance with the existing land use and the return period of probable flood. The numbers of buildings and the areas of agricultural crop fields to be inundated are estimated dividing into two situations of without-project and with-project by the return period of probable flood for the said five project areas, and the results are given in Tables 11.2.1 to 11.2.5.

The average appraisal values of buildings, household effects and agricultural field crops, and the flood damage rates of these assets are based on the results of interview surveys at the present feasibility and the previous master plan stages. Details are given in Sections 2.2.3 and 2.2.4 of Supporting Report J.

In addition to flood damage to the said assets, damages to public facilities and losses in business activities are taken into account. These damages are assumed to be 34 % and 6 % of the damage to general assets, on the basis of data of the similar projects, which have been carried out in other countries.

(Remarks : 1. Major losses in the economic activities are caused by the suspensions of business activities and road traffic in and around the inundation areas,
2. According to the Economic Evaluation Manual of the Flood Control Project, published by the Ministry of Construction, Japan, the loss rate of the economic activities would be approximately estimated at 6 % of damage to the general assets.)

Under the conditions above, the flood damage amounts are estimated according to kind of assets and return periods of probable flood, for two situations of the without-project and with-project. The results are given in the Supporting Report J, Tables J.2.13 to J.2.19, and a difference between the without-project and with-project situations on the damage is as follows:

Estimate of Flood Damage Reduced

Name of Projects	Return Period (year)				
	2	5	10	20	50
I. Chane-Pailon	102,955	116,564	119,939	145,504	129,059
1. Rio Chane	19,183	13,761	11,813	22,645	9,835
2. Rio Pailon	67,490	81,868	81,119	90,921	83,379
3. Okinawa Drainage	16,282	20,935	27,007	31,938	35,845
II. San Juan-Antofagasta	37,897	46,652	58,206	54,981	61,057
1. San Juan	13,160	17,652	24,449	22,905	21,499
2. Antofagasta	24,737	29,000	33,757	32,076	39,558

Unit : Bs. 1,000

(3) Average Annual Benefit Expected

Using the damage amounts for each return period shown above, the average annual flood damages of respective projects are calculated taking the occurrence probability of flood into account. The result is summarized as follows:

Average Annual Flood Damage

Name of Projects	Without-Project	With-Project	Reduction in Damage (Annual Benefit)
I. Chane-Pailon	115,663	34,418	81,245
1. Rio Chane	38,550	26,186	12,364
2. Rio Pailon	61,979	7,639	54,340
3. Okinawa Drainage	15,134	593	14,541
II. San Juan-Antofagasta	73,156	41,187	31,969
1. San Juan	46,165	34,299	11,866
2. Antofagasta	26,991	6,888	20,103

Unit : Bs. 1,000

As shown in the table above, reduction in the average annual flood damage expected by executing the project would be estimated at Bs. 81.245 Million for the Chane-Pailon Project and Bs. 31.969 Million for the San Juan-Antofagasta Project. These annual reduction effects in flood damage would be given as a direct tangible benefit expected to accrue every year during the period of project life with 30 years after completion of the construction works. These annual benefits are transferred to Tables 11.2.6 to 11.2.7, for comparing with the costs of projects.

11.2.2 Economic Cost

The economic costs would be given by converting the project costs, taking transfer payments and opportunity costs into account.

The annual economic costs of projects are shown in the Supporting Report J, Tables J.3.1 to J.3.7, and these are transferred to Tables J.4.1 to J.4.4 for comparing with the economic benefits. The totals of economic and financial costs of the respective projects are summarized below:

Comparison of Economic Costs and Financial Costs of the Projects

Name of Projects	Construction Cost		Annual OM Cost	
	Financial Cost	Economic Costs	Financial Cost	Economic Cost
I. Chane-Pailon	1,011,012	584,596	11,125	4,334
1. Rio Chane	301,618	196,015	2,849	1,453
2. Rio Pailon	593,155	313,056	5,958	2,321
3. Okinawa Drainage	116,239	75,525	1,433	560
II. San Juan-Antofagasta	289,063	172,701	3,314	1,279
1. San Juan	158,533	89,184	1,712	660
2. Antofagasta	130,530	83,517	1,602	619

Unit : Bs. 1,000

Note: Financial cost includes price contingency.

11.2.3 Cost-Benefit Analysis

(1) Estimates of EIRR, NPV and B/C

The proposed projects consist of two parts of the Chane-Pailon project and the San Juan-Antofagasta project. The former is composed of three sub-projects of the Rio Chane, the Rio Pailon and the Okinawa drainage. The latter is divided into two sub-projects of San Juan and Antofagasta areas.

The economic feasibility of these projects is examined using the annual flows of economic cost and economic benefit shown in the Tables 11.2.6 and 11.2.7, based on the evaluation factors of EIRR, NPV and B/C. The results are listed at the lower parts of the said tables, and the EIRR is summarized below:

Name of Projects	EIRR (%)
I. Chane-Pailon	12.1
1. Rio Chane	3.8
2. Rio Pailon	16.4
3. Okinawa Drainage	18.4
II. San Juan-Antofagasta	18.2
1. San Juan	12.4
2. Antofagasta	23.4

The opportunity cost of capital is estimated to be between 10 % and 12 % in Bolivia. Accordingly, the Chane-Pailon project and the San Juan-Antofagasta project would

be economically feasible. The four projects other than the Rio Chane area could be expected a fairly high economic return.

An improvement of the Rio Chane would be essential for improving the Rio Pailon as her lower reach and might have a good effect for improving the flood situation of the other tributaries such as the Quebrada Chane and Quebrada Las Chacras, which are not included in the Study, though the Rio Chane area is regarded to be economically unfeasible.

(2) Sensitivity Analysis

The effect to EIRR is examined under the pessimistic conditions of the 5 %- and 10 %-increases in the economic cost and the 5 %- and 10 %-decreases in the economic benefit, for two projects and four sub-projects except the Rio Chane sub-project. The results are as follows:

Sensitivity Analysis of EIRR (%)

I. Chane-Pailon Project

Decrease in Benefit	Increase in Cost 0 %	5 %	10 %
0 %	12.1	11.4	10.9
5 %	11.4	10.8	10.2
10 %	10.7	10.1	9.6

II. San Juan-Antofagasta Project

Decrease in Benefit	Increase in Cost 0 %	5 %	10 %
0 %	18.2	17.2	16.4
5 %	17.2	16.3	15.5
10 %	16.2	15.4	14.6

I-1.Rio Pailon Area

Decrease in Benefit	Increase in Cost 0 %	5 %	10 %
0 %	16.4	15.5	14.8
5 %	15.5	14.7	14.0
10 %	14.6	13.9	13.2

II-1.San Juan Area

Decrease in Benefit	Increase in Cost 0 %	5 %	10 %
0 %	12.4	11.6	11.1
5 %	11.7	11.0	10.4
10%	10.9	10.3	9.7

I-2. Okinawa Drainage Area

Decrease in Benefit	Increase in Cost 0 %	5 %	10 %
0 %	18.4	17.5	16.6
5 %	17.4	16.5	15.7
10 %	16.4	15.6	14.9

II-2. Antofagasta Area

Decrease in Benefit	Increase in Cost 0 %	5 %	10 %
0 %	23.4	22.3	21.2
5 %	22.2	21.1	20.1
10 %	21.0	20.0	19.0

EIRR of the Chane-Pailon project maintains more than 10.0 % which is the economically feasible, except a pessimistic condition where the increase in cost and the decrease in benefit are both 10 %. In the same condition, the Rio Pailon area and the Okinawa drainage area show still high values of EIRR of 13.2 % and 14.9 %, respectively.

The San Juan-Antofagasta project also holds a high EIRR of 14.6 %, under the condition which the increase in cost and the decrease in benefit are both 10 %. In the

same condition, the Antofagasta area maintains a high EIRR of 19.0 %, and the San Juan area holds more than 10.0 %, except a pessimistic condition where the increase in cost and the decrease in benefit are both 10 %.

In conclusion of the economic evaluation, two projects of the Chane-Pailon and the San Juan-Antofagasta are economically feasible, and it is expected to produce a large economic return for inhabitants in the flood prone area by implementing the projects.

11.3 Indirect Economic Effects

11.3.1 Structural Measures

In addition to the direct economic effects above, the project would be expected to produce the indirect socio-economic benefit as follows:

(1) The projects are expected to contribute to the improvement of social and economic aspects in the Study Area throughout the reductions in:
   1) Interruption of traffic and communications,
   2) Increase in idle laborers,
   3) Spread of disease,
   4) Drop in quality of crops,
   5) Increase in unit production costs in factories and agricultural lands, and
   6) Rise in consumer prices.

(2) The project could be expected forward- and backward-linkage effects. As a forward effect, for example, the agricultural products such as soybeans and sugar cane will increase their productions by implementing the flood mitigation project. The increased production will produce an increase in the net profits of the soybean oil-refineries and sugar-manufacturing factories, and it is further expected that exports of soybean oil and sugar will be increased.

As a backward effect, an increase in the agricultural production, for example, will produce an increase in fertilizer production, and as the result it is expected that the fertilizer plants will get an increased net profit.

(3) The projects will have a stimulate impact to the development of regional economy owing to the investment of large fund, and as the result it will produce an increase in income of inhabitants, and will be to rise the regional GDP.

11.3.2 Non-structural Measures

The proposed non-structural measures would be

(1) To establish flood warning system,
(2) To establish a institutional organization for flood mitigation,
(3) To prepare a flood hazard map,
(4) To control a land use in natural retarding basins, and
(5) To conserve forest along the river channels.

These measures would have a reduction effect in flood damage, supporting the structural measures. For instance, the establishment of flood warning system will produce a reduction effect in flood damage to the removal assets such as household effects and livestock. However, it is difficult to estimate reasonably its benefit, because it has to set up many assumptions for estimating the benefit.

In addition, the non-structural measures could be expected an improvement effect of social communications, due to that the inhabitants participate in the flood mitigation project. The non-structural measures would be generally evaluated as an intangible effect of the project.

11.4 Financial Aspect

During the period of 10 years from 2001 to 2010, the project cost disbursed will amount to Bs. 906.5 Million (US$ 165 Million) at the 1998 constant price, at the annual rate of Bs. 90.6 Million (US$ 16.5 Million) on average.

According to the Government budget of Bolivia, the budget expenditure to public investment in the Department of Santa Cruz was approximately US$ 100 Million per annum, during the period 1992-1997. Accordingly, annual disbursement of the project is only one-sixth (1/6) of the annual public investment in the Department of Santa Cruz. Judging from such a financial aspect, the project will be possible to realize.

In Bolivia, the greater part of public investment to infrastructures has been provided by aid funds from the multilateral and bilateral agencies. In the aid funds, a ratio of credit to grant would be estimated to be approximately 80 : 20, based on the external aid to public projects of the Department of Santa Cruz in 1996 and 1997. Should a grant be supplied as a fund of the project from the external agencies, the project will be to get a favorable financial situation.

The total cost of project would amount to Bs. 906 Million (at the 1998 constant price) during 10 years from 2001 to 2010. Should it be assumed that all the projects cost will be provided by the external aids, and a ratio credit to grant will be 80 : 20, the credit and grant portions amount to Bs. 725 Million and 181 Million, respectively.

According to the disbursement schedule of the project, the annual disbursement would amount to Bs. 4 Million in the first year, Bs. 56 Million in the second year, Bs. 45 Million in the third year and Bs. 104 Million in the fourth year. It is desirable that the disbursement in these early years depends on the grant of the external aid, considering that it is difficult to get the external credit aid in the early stage.

After completion of the construction works, the annual O&M cost for facilities of the project is estimated at Bs. 6.8 Million at the 1998 constant price. Assuming that Municipalities related to the project will maintain the facilities, the existing public budgets of these Municipalities should be examined below.

The public investment budget of Municipalities of Warnes, G. Saavedra and San Carlos in 1998 was Bs. 25.3 Million in total for 12 projects, i.e. Bs. 2.1 Million a project. Among the 12 projects, the maximum cost per project was Bs. 8.4 Million for the construction and maintenance of local roads. The OM cost of the present project is less than the annual cost of the said road project in the three Municipalities, though it amount to 3.2 times of the average annual cost per project for 12 projects.

The operation and maintenance of the project as a whole will be commenced in 2011, and it is expected that GRDP of the Department of Santa Cruz in 2010 will become twice as much that in 1998.

Under the things mentioned above, it seems that the operation and maintenance conducted by the Municipalities will not be so difficult in the financial aspect.

11.5 Project Evaluation

The project would be evaluated from technical, economic, financial, and social and natural environment points of view, as shown below:

(1) Technical Feasibility

The proposed structural measures will be very effective for reducing inundation areas of more than 30 cm about 279 km2 in Chane-Pailon area and 197.70 km2 in San Juan-Antofagasta area during the 10-year floods. As for the Chane River the water levels without projects are about 60 cm higher than that of with projects in the peak stage for the 10-year floods. In order to avoid any adverse effects, the improvement of the Chane river will be required for the area. All projects are no problem technically on construction works and technical management. Operating and maintenance of facilities after completion of the construction works also will be possible, judging from the existing situation of operation and maintenance of the Rio Piray project.

(2) Economic Feasibility

The four sub-projects of the Rio Pailon area, the Okinawa drainage, the San Juan area and the Antofagasta area show an EIRR of 16.4 %, 18.4 %, 12.4 % and 23.4 % respectively, and those could be expected a fairly high economic return by implementing them. A river improvement of the Rio Chane would be essential for improve the Rio Pailon as her lower reach, even though an evaluation of the Rio Chane area is economically unfeasible

The Chane-Pailon project, which contains three areas of the Rio Chane, the Rio Pailon and the Okinawa drainage, is economically feasible, indicating an EIRR of 12.1 %. The San Juan-Antofagasta project, which consists of the San Juan and the Antofagasta areas, would come to a high EIRR of 18.2 %. Accordingly, the said two projects is expected to contribute to a promotion of economic development in the region.

Besides the benefits produced by the structural measures above, lots of intangible benefits would be produced from the non-structural measures.

(3) Social and Natural Environmental Impacts

The flood mitigation and drainage improvement aim basically to improve social and natural environments in the region

The social environment will be improved due to that the structural measures will reduce an interruption of business activities and social communications, and the non-structural measures will promote the good communications among inhabitants.

The natural environment will be improved due to that the project will reduce the natural destruction such as erosion of land and deposit of earth and sand caused by floods and bad drainage system.

To the contrary, the negative impact to environment is hardly found, except noise pollution and traffic control during the period of construction works.

(4) Financial Aspect

A raise the project cost including the OM cost will be possible, based on the discussion described in Section 11.4.

Under the discussion above, the project would be concluded to be feasible from technical, economic, financial and environmental points of view, and it is expected to realize as soon as possible.

TABLES

TABLE 11.2.1(1) DISTRIBUTION OF ASSETS TO BE INUNDATED IN THE RIO CHANE AREA(WITHOUT)

Distribution of Buildings	Total	Residence			Shop	School	Factory	Health Center
		High	Medium	Low				
	100.0%	8.0%	33.0%	55.0%	3.0%	0.2%	0.5%	0.3%

(1) 2-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	66	5	22	36	2	0	0	0	197	222	952	57	1,428
2	0.25-0.5	96	8	32	53	3	0	0	0	275	310	1,007	80	1,672
3	0.5-1.0	207	17	68	114	6	0	1	1	588	662	2,042	172	3,464
4	1.0-1.5	62	5	20	34	2	0	0	0	190	214	1,008	56	1,468
5	1.5-2.0	6	0	2	3	0	0	0	0	19	22	101	6	148
	Total	437	35	144	241	13	1	2	1	1,269	1,430	5,110	371	8,180

(2) 5-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	66	5	22	36	2	0	0	0	197	222	952	57	1,428
2	0.25-0.5	96	8	32	53	3	0	0	0	275	310	1,007	80	1,672
3	0.5-1.0	207	17	68	114	6	0	1	1	588	662	2,042	172	3,464
4	1.0-1.5	56	5	19	31	2	0	0	0	173	194	917	51	1,335
5	1.5-2.0	12	1	4	7	0	0	0	0	36	41	193	11	281
	Total	437	35	144	241	13	1	2	1	1,269	1,429	5,111	371	8,180

(3) 10-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	66	5	22	36	2	0	0	0	86	97	623	25	831
2	0.25-0.5	96	8	32	53	3	0	0	0	203	228	660	59	1,150
3	0.5-1.0	207	17	68	114	6	0	1	1	464	523	1,339	136	2,462
4	1.0-1.5	56	5	19	31	2	0	0	0	338	382	1,988	99	2,807
5	1.5-2.0	12	1	4	7	0	0	0	0	176	198	1,034	51	1,459
	Total	437	35	144	241	13	1	2	1	1,267	1,428	5,644	370	8,709

(4) 20-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	14	1	5	8	0	0	0	0	0	0	383	0	383
2	0.25-0.5	14	1	5	8	0	0	0	0	0	0	386	0	386
3	0.5-1.0	29	2	10	16	1	0	0	0	0	0	772	0	772
4	1.0-1.5	196	16	65	108	6	0	1	1	595	671	2,055	174	3,495
5	1.5-2.0	221	18	73	122	7	0	1	1	672	756	2,320	190	3,938
	Total	474	38	156	261	14	1	2	1	1,267	1,427	5,916	364	8,974

(5) 50-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	15	1	5	8	0	0	0	0	0	0	453	0	453
2	0.25-0.5	13	1	4	7	0	0	0	0	0	0	350	0	350
3	0.5-1.0	25	2	8	14	1	0	0	0	0	0	650	0	650
4	1.0-1.5	153	12	50	84	5	0	1	0	455	512	1,662	133	2,762
5	1.5-2.0	273	22	90	150	8	1	1	1	816	924	2,970	230	4,940
	Total	479	38	158	263	14	1	2	1	1,271	1,436	6,085	363	9,155

TABLE 11.2.1(2) DISTRIBUTION OF ASSETS TO BE INUNDATED IN THE RIO CHANE AREA(WITH)

Distribution of Buildings	Total	Residence			Shop	School	Factory	Health Center
		High	Medium	Low				
	100.0%	8.0%	33.0%	55.0%	3.0%	0.2%	0.5%	0.3%

(1) 2-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0.25-0.5	23	2	7	12	1	0	0	0	58	65	135	17	275
3	0.5-1.0	56	5	19	31	2	0	0	0	143	161	338	42	684
4	1.0-1.5	138	11	46	76	4	0	1	0	346	390	1,383	101	2,220
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	217	17	72	119	7	0	1	1	547	616	1,856	160	3,179

(2) 5-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	100	8	33	55	3	0	1	0	330	372	1,369	96	2,167
2	0.25-0.5	105	8	35	58	3	0	1	0	293	330	1,136	86	1,845
3	0.5-1.0	213	17	70	117	6	0	1	1	569	641	2,155	166	3,531
4	1.0-1.5	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	419	34	138	230	13	1	2	1	1,192	1,343	4,660	348	7,543

(3) 10-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	88	7	29	49	3	0	0	0	281	317	1,253	82	1,933
2	0.25-0.5	63	5	21	35	2	0	0	0	174	197	826	51	1,248
3	0.5-1.0	113	9	37	62	3	0	1	0	295	332	1,439	86	2,152
4	1.0-1.5	77	6	25	42	2	0	0	0	221	248	700	65	1,234
5	1.5-2.0	104	8	34	57	3	0	1	0	221	336	940	80	1,577
	Total	445	36	147	245	13	1	2	1	1,192	1,430	5,158	364	8,144

(4) 20-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	53	4	17	29	2	0	0	0	134	152	955	39	1,280
2	0.25-0.5	49	4	16	27	1	0	0	0	140	158	676	41	1,015
3	0.5-1.0	95	8	31	52	3	0	0	0	284	320	1,213	83	1,900
4	1.0-1.5	84	7	28	46	3	0	0	0	194	218	914	57	1,383
5	1.5-2.0	155	12	51	85	5	0	1	0	360	420	1,680	120	2,580
	Total	435	35	144	239	13	1	2	1	1,112	1,268	5,438	340	8,158

(5) 50-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	24	2	8	13	1	0	0	0	44	50	553	13	660
2	0.25-0.5	23	2	8	13	1	0	0	0	43	48	466	13	570
3	0.5-1.0	46	4	15	25	1	0	0	0	85	96	889	25	1,095
4	1.0-1.5	112	9	37	62	3	0	1	0	324	366	1,138	95	1,923
5	1.5-2.0	258	21	85	142	8	1	1	1	744	840	2,620	210	4,414
	Total	464	37	153	255	14	1	2	1	1,240	1,400	5,666	356	8,662

TABLE 11.2.2(1) DISTRIBUTION OF ASSETS TO BE INUNDATED IN THE RIO PAILON AREA(WITHOUT)

Distribution of Buildings	Total	Residence			Shop	School	Factory	Health Center
		High	Medium	Low				
	100.0%	8.0%	33.0%	55.0%	3.0%	0.2%	0.5%	0.3%

(1) 2-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	219	18	72	121	7	0	1	1	1,344	1,512	1,020	390	4,266
2	0.25-0.5	179	14	59	99	5	0	1	1	1,152	1,296	370	340	3,158
3	0.5-1.0	339	27	112	186	10	1	2	1	2,208	2,496	430	650	5,784
4	1.0-1.5	298	24	98	164	9	1	1	1	1,824	2,064	580	530	4,998
5	1.5-2.0	30	2	10	16	1	0	0	0	180	204	60	50	494
	Total	1,065	85	352	586	32	2	5	3	6,708	7,572	2,460	1,960	18,700

(2) 5-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	141	11	46	77	4	0	1	0	876	984	590	260	2,710
2	0.25-0.5	139	11	46	77	4	0	1	0	900	1,020	340	260	2,520
3	0.5-1.0	277	22	92	153	8	1	1	1	1,824	2,052	560	530	4,966
4	1.0-1.5	445	36	147	245	13	1	2	1	2,700	3,036	950	790	7,476
5	1.5-2.0	93	7	31	51	3	0	0	0	564	636	200	170	1,570
	Total	1,096	88	362	603	33	2	5	3	6,864	7,728	2,640	2,010	19,242

(3) 10-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	135	11	44	74	4	0	1	0	852	960	590	250	2,652
2	0.25-0.5	147	12	48	81	4	0	1	0	960	1,080	330	280	2,650
3	0.5-1.0	299	24	99	165	9	1	1	1	1,980	2,232	540	580	5,332
4	1.0-1.5	364	29	120	200	11	1	2	1	2,196	2,472	860	640	6,168
5	1.5-2.0	189	15	63	104	6	0	1	1	1,140	1,284	440	330	3,194
	Total	1,134	91	374	624	34	2	6	3	7,128	8,028	2,760	2,080	19,996

(4) 20-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	103	8	34	57	3	0	1	0	588	672	590	170	2,020
2	0.25-0.5	115	9	38	63	3	0	1	0	744	840	350	220	2,154
3	0.5-1.0	234	19	77	129	7	0	1	1	1,560	1,752	580	450	4,342
4	1.0-1.5	333	27	110	183	10	1	2	1	2,088	2,352	590	610	5,640
5	1.5-2.0	377	30	124	207	11	1	2	1	2,364	2,652	670	690	6,376
	Total	1,162	93	383	639	35	2	6	3	7,344	8,268	2,780	2,140	20,532

(5) 50-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	85	7	28	47	3	0	0	0	504	564	460	150	1,678
2	0.25-0.5	116	9	38	64	3	0	1	0	768	864	350	220	2,202
3	0.5-1.0	247	20	82	136	7	0	1	1	1,668	1,872	660	490	4,690
4	1.0-1.5	267	21	88	147	8	1	1	1	1,668	1,872	490	490	4,520
5	1.5-2.0	479	38	158	263	14	1	2	1	2,976	3,348	870	870	8,064
	Total	1,193	95	394	656	36	2	6	4	7,584	8,520	2,830	2,220	21,154

TABLE 11.2.2(2) DISTRIBUTION OF ASSETS TO BE INUNDATED IN THE RIO PAILON AREA(WITH)

Distribution of Buildings	Total	Residence			Shop	School	Factory	Health Center
		High	Medium	Low				
	100.0%	8.0%	33.0%	55.0%	3.0%	0.2%	0.5%	0.3%

(1) 2-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0.25-0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0.5-1.0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1.0-1.5	85	7	28	47	3	0	0	0	516	588	10	150	1,264
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	85	7	28	47	3	0	0	0	516	588	10	150	1,264

(2) 5-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	112	9	37	62	3	0	1	0	624	708	440	190	1,962
2	0.25-0.5	57	5	19	31	2	0	0	0	312	348	120	90	870
3	0.5-1.0	85	7	28	47	3	0	0	0	468	516	90	130	1,204
4	1.0-1.5	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	254	20	84	140	8	1	1	1	1,404	1,572	650	410	4,036

(3) 10-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	152	12	50	83	5	0	1	0	732	1,092	450	280	2,554
2	0.25-0.5	76	6	25	42	2	0	0	0	456	516	140	130	1,242
3	0.5-1.0	115	9	38	63	3	0	1	0	648	732	120	190	1,690
4	1.0-1.5	7	1	2	4	0	0	0	0	12	24	40	10	86
5	1.5-2.0	9	1	3	5	0	0	0	0	12	36	50	10	108
	Total	358	29	118	197	11	1	2	1	1,860	2,400	800	620	5,680

(4) 20-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	172	14	57	91	5	0	1	1	1,008	1,128	490	290	2,916
2	0.25-0.5	84	7	28	46	3	0	0	0	480	552	150	140	1,322
3	0.5-1.0	124	10	41	68	4	0	1	0	708	804	120	210	1,842
4	1.0-1.5	1	0	0	1	0	0	0	0	0	0	20	0	20
5	1.5-2.0	2	0	1	1	0	0	0	0	0	0	40	0	40
	Total	382	31	126	210	11	1	2	1	2,196	2,484	820	640	6,140

(5) 50-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	296	24	98	163	9	1	1	1	2,004	2,256	860	580	5,700
2	0.25-0.5	135	11	44	74	4	0	1	0	864	972	210	250	2,296
3	0.5-1.0	189	15	62	104	6	0	1	1	1,152	1,296	110	340	2,898
4	1.0-1.5	14	1	5	8	0	0	0	0	84	96	10	20	210
5	1.5-2.0	33	3	11	18	1	0	0	0	192	216	20	50	478
	Total	668	53	220	367	20	1	3	2	4,296	4,836	1,210	1,240	11,582

TABLE 11.2.3(1) DISTRIBUTION OF ASSETS TO BE INUNDATED IN THE OKINAWA DRAINAGE AREA(WITHOUT)

Distribution of Buildings	Total	Residence			Shop	School	Factory	Health Center
		High	Medium	Low				
	100.0%	8.0%	33.0%	55.0%	3.0%	0.2%	0.5%	0.3%

(1) 2-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	90	7	30	50	3	0	0	0	2,030	44	0	480	2,554
2	0.25-0.5	72	6	24	40	2	0	0	0	1,471	32	0	348	1,851
3	0.5-1.0	135	11	45	74	4	0	1	0	2,663	58	0	630	3,351
4	1.0-1.5	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	297	24	98	163	9	1	1	1	6,164	134	0	1,458	7,756

(2) 5-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	60	5	20	33	2	0	0	0	1,273	28	0	301	1,602
2	0.25-0.5	69	6	23	38	2	0	0	0	1,496	32	0	357	1,885
3	0.5-1.0	143	11	47	79	4	0	1	0	3,104	67	0	735	3,906
4	1.0-1.5	41	3	14	23	1	0	0	0	632	13	0	150	795
5	1.5-2.0	9	1	3	5	0	0	0	0	133	2	0	31	166
	Total	322	26	106	177	10	1	2	1	6,638	142	0	1,574	8,354

(3) 10-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	61	5	20	34	2	0	0	0	1,399	30	0	331	1,760
2	0.25-0.5	60	5	20	33	2	0	0	0	1,334	29	0	316	1,679
3	0.5-1.0	119	10	39	65	4	0	1	0	2,636	58	0	624	3,318
4	1.0-1.5	88	7	29	48	3	0	0	0	1,621	35	0	384	2,040
5	1.5-2.0	46	4	15	25	1	0	0	0	844	18	0	200	1,062
	Total	374	30	123	206	11	1	2	1	7,834	170	0	1,855	9,859

(4) 20-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	41	3	14	23	1	0	0	0	889	19	0	210	1,118
2	0.25-0.5	44	4	15	24	1	0	0	0	973	22	0	230	1,225
3	0.5-1.0	91	7	30	50	3	0	0	0	1,987	43	0	470	2,500
4	1.0-1.5	105	8	35	58	3	0	1	0	2,093	46	0	495	2,634
5	1.5-2.0	118	9	39	65	4	0	1	0	2,364	46	0	560	2,970
	Total	399	32	132	219	12	1	2	1	8,306	176	0	1,965	10,447

(5) 50-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	25	2	8	14	1	0	0	0	455	10	0	108	573
2	0.25-0.5	33	3	11	18	1	0	0	0	703	16	0	166	885
3	0.5-1.0	70	6	23	39	2	0	0	0	1,530	34	0	362	1,926
4	1.0-1.5	105	8	35	58	3	0	1	0	2,141	47	0	507	2,695
5	1.5-2.0	187	15	62	103	6	0	1	1	3,828	84	0	910	4,822
	Total	420	34	139	231	13	1	2	1	8,657	191	0	2,053	10,901

TABLE 11.2.3(2) DISTRIBUTION OF ASSETS TO BE INUNDATED IN THE OKINAWA DRAINAGE AREA(WITH)

Distribution of Buildings	Total	Residence			Shop	School	Factory	Health Center
		High	Medium	Low				
	100.0%	8.0%	33.0%	55.0%	3.0%	0.2%	0.5%	0.3%

(1) 2-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0.25-0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0.5-1.0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1.0-1.5	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0

(2) 5-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	24	2	8	13	1	0	0	0	516	11	0	122	649
2	0.25-0.5	5	0	2	3	0	0	0	0	103	2	0	24	129
3	0.5-1.0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1.0-1.5	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	29	2	10	16	1	0	0	0	619	13	0	146	778

(3) 10-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	68	5	22	37	2	0	0	0	1381	30	0	327	1,738
2	0.25-0.5	14	1	5	8	0	0	0	0	276	6	0	65	347
3	0.5-1.0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1.0-1.5	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	82	7	27	45	2	0	0	0	1,657	36	0	392	2,085

(4) 20-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0 25	120	10	40	66	4	0	1	0	2,233	48	0	529	2,810
2	0.25-0.5	27	2	9	15	1	0	0	0	527	12	0	125	664
3	0.5-1.0	8	1	3	4	0	0	0	0	200	5	0	48	253
4	1.0-1.5	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	155	12	51	85	5	0	1	0	2,960	65	0	702	3,727

(5) 50-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	123	10	41	68	4	0	1	0	2,322	50	0	549	2,921
2	0.25-0.5	35	3	12	19	1	0	0	0	694	16	0	164	874
3	0.5-1.0	26	2	9	14	1	0	0	0	574	12	0	136	722
4	1.0-1.5	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	184	15	61	101	6	0	1	1	3,590	78	0	849	4,517

TABLE 11.2.4(1) DISTRIBUTION OF ASSETS TO BE INUNDATED IN THE SAN JUAN AREA(WITHOUT)

Distribution of Buildings	Total	Residence			Shop	School	Factory	Health Center
		High	Medium	Low				
	100.0%	8.0%	33.0%	55.0%	3.0%	0.2%	0.5%	0.3%

(1) 2-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	406	32	134	223	12	1	2	1	1,088	5,448	194	91	6,821
2	0.25-0.5	235	19	78	129	7	0	1	1	632	3,163	39	53	3,887
3	0.5-1.0	385	31	127	212	12	1	2	1	1,036	5,184	0	86	6,306
4	1.0-1.5	302	24	100	166	9	1	2	1	613	3,069	0	51	3,733
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	1,328	106	438	730	40	3	7	4	3,369	16,864	233	281	20,747

(2) 5-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	330	26	109	182	10	1	2	1	884	4,428	191	74	5,577
2	0.25-0.5	239	19	79	131	7	0	1	1	639	3,197	40	53	3,929
3	0.5-1.0	433	35	143	238	13	1	2	1	1,154	5,779	6	96	7,035
4	1.0-1.5	372	30	123	205	11	1	2	1	794	3,972	0	66	4,832
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	1,374	110	453	756	41	3	7	4	3,471	17,376	237	289	21,373

(3) 10-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	304	24	100	167	9	1	2	1	821	4,108	144	68	5,141
2	0.25-0.5	263	21	87	145	8	1	1	1	705	3,531	52	59	4,347
3	0.5-1.0	506	40	167	278	15	1	3	2	1,353	6,774	57	113	8,297
4	1.0-1.5	467	37	154	257	14	1	2	1	1,029	5,151	0	86	6,266
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	1,540	123	508	847	46	3	8	5	3,908	19,564	253	326	24,051

(4) 20-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	242	19	80	133	7	0	1	1	665	3,327	137	55	4,184
2	0.25-0.5	254	20	84	140	8	1	1	1	683	3,421	53	57	4,214
3	0.5-1.0	513	41	169	282	15	1	3	2	1,376	6,890	63	115	8,444
4	1.0-1.5	571	46	188	314	17	1	3	2	1,294	6,475	0	108	7,877
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	1,580	126	521	869	47	3	8	5	4,018	20,113	253	335	24,719

(5) 50-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	271	22	89	149	8	1	1	1	747	3,740	137	62	4,686
2	0.25-0.5	250	20	83	138	8	1	1	1	677	3,391	62	57	4,187
3	0.5-1.0	491	39	162	270	15	1	2	1	1,320	6,609	86	110	8,125
4	1.0-1.5	604	48	199	332	18	1	3	2	1,404	7,027	0	117	8,548
5	1.5-2.0	60	5	20	33	2	0	0	0	140	703	0	12	855
	Total	1,676	134	553	922	50	3	8	5	4,288	21,470	285	358	26,401

TABLE 11.2.4(2) DISTRIBUTION OF ASSETS TO BE INUNDATED IN THE SAN JUAN AREA(WITH)

Distribution of Buildings	Total	Residence			Shop	School	Factory	Health Center
		High	Medium	Low				
	100.0%	8.0%	33.0%	55.0%	3.0%	0.2%	0.5%	0.3%

(1) 2-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	113	9	37	62	3	0	1	0	302	1,511	30	25	1,868
2	0.25-0.5	146	12	48	80	4	0	1	0	398	1,993	6	33	2,430
3	0.5-1.0	308	25	102	169	9	1	2	1	844	4,227	0	70	5,141
4	1.0-1.5	285	23	94	157	9	1	1	1	578	2,893	0	48	3,519
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	852	68	281	469	26	2	4	3	2,122	10,624	36	176	12,958

(2) 5-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	136	11	45	75	4	0	1	0	368	1,844	20	31	2,263
2	0.25-0.5	151	12	50	83	5	0	1	0	413	2,070	4	34	2,521
3	0.5-1.0	311	25	103	171	9	1	2	1	850	4,253	0	71	5,174
4	1.0-1.5	308	25	102	169	9	1	2	1	639	3,196	0	53	3,888
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	906	72	299	498	27	2	5	3	2,270	11,363	24	189	13,846

(3) 10-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	184	15	61	101	6	0	1	1	496	2,482	54	41	3,073
2	0.25-0.5	137	11	45	75	4	0	1	0	373	1,868	11	31	2,283
3	0.5-1.0	250	20	83	138	8	1	1	1	685	3,429	0	57	4,171
4	1.0-1.5	404	32	133	222	12	1	2	1	894	4,474	0	75	5,443
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	975	78	322	536	29	2	5	3	2,448	12,253	65	204	14,970

(4) 20-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	172	14	57	95	5	0	1	1	451	2,259	47	38	2,795
2	0.25-0.5	147	12	49	81	4	0	1	0	402	2,013	14	34	2,463
3	0.5-1.0	281	22	93	155	8	1	1	1	780	3,904	11	65	4,760
4	1.0-1.5	453	36	149	249	14	1	2	1	1,018	5,094	0	85	6,197
5	1.5-2.0	36	3	12	20	1	0	0	0	81	408	0	7	496
	Total	1,089	87	359	599	33	2	5	3	2,732	13,678	72	229	16,711

(5) 50-Year Return Period

No.	Water Depth (m)	No. of Build-dings	Buildings							Agricultural Crops (ha)				
			Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	216	17	71	119	6	0	1	1	569	2851	67	47	3,534
2	0.25-0.5	168	13	55	92	5	0	1	1	457	2286	15	38	2,796
3	0.5-1.0	312	25	103	172	9	1	2	1	857	4290	3	71	5,221
4	1.0-1.5	457	37	151	251	14	1	2	1	1049	5254	0	88	6,391
5	1.5-2.0	101	8	33	56	3	0	1	0	231	1156	0	19	1,406
	Total	1,254	100	414	690	38	3	6	4	3,163	15,837	85	263	19,348

TABLE 11.2.5(1) DISTRIBUTION OF ASSETS TO BE INUNDATED IN THE ANTOFAGASTA AREA(WITHOUT)

Distribution of Buildings	Total	Residence			Shop	School	Factory	Health Center
		High	Medium	Low				
	100.0%	8.0%	33.0%	55.0%	3.0%	0.2%	0.5%	0.3%

(1) 2-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	255	20	84	140	8	1	1	1	1,515	1,945	386	0	3,846
2	0.25-0.5	192	15	63	106	6	0	1	1	1,091	1,399	77	0	2,567
3	0.5-1.0	353	28	116	194	11	1	2	1	1,969	2,526	0	0	4,495
4	1.0-1.5	65	5	21	36	2	0	0	0	192	247	0	0	439
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	865	69	285	476	26	2	4	3	4,767	6,117	463	0	11,347

(2) 5-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	232	19	77	128	7	0	1	1	1,280	1,643	403	0	3,326
2	0.25-0.5	215	17	71	118	6	0	1	1	1,235	1,585	81	0	2,901
3	0.5-1.0	420	34	139	231	13	1	2	1	2,448	3,141	0	0	5,589
4	1.0-1.5	91	7	30	50	3	0	0	0	314	404	0	0	718
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	958	77	316	527	29	2	5	3	5,277	6,773	484	0	12,534

(3) 10-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	281	22	93	155	8	1	1	1	1,500	1,925	516	0	3,941
2	0.25-0.5	239	19	79	131	7	0	1	1	1,387	1,779	103	0	3,269
3	0.5-1.0	458	37	151	252	14	1	2	1	2,716	3,485	0	0	6,201
4	1.0-1.5	147	12	49	81	4	0	1	0	609	782	0	0	1,391
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	1,125	90	371	619	34	2	6	3	6,212	7,971	619	0	14,802

(4) 20-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	208	17	69	114	6	0	1	1	1,069	1,372	636	0	3,077
2	0.25-0.5	240	19	79	132	7	0	1	1	1,379	1,770	127	0	3,276
3	0.5-1.0	497	40	164	273	15	1	2	1	2,914	3,739	0	0	6,653
4	1.0-1.5	196	16	65	108	6	0	1	1	911	1,169	0	0	2,080
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	1,141	91	377	628	34	2	6	3	6,273	8,050	763	0	15,086

(5) 50-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	135	11	45	74	4	0	1	0	693	890	637	0	2,220
2	0.25-0.5	187	15	62	103	6	0	1	1	1,049	1,346	127	0	2,522
3	0.5-1.0	400	32	132	220	12	1	2	1	2,276	2,920	0	0	5,196
4	1.0-1.5	308	25	102	169	9	1	2	1	1,661	2,131	0	0	3,792
5	1.5-2.0	123	10	41	68	4	0	1	0	664	852	0	0	1,516
	Total	1,153	92	380	634	35	2	6	3	6,343	8,139	764	0	15,246

TABLE 11.2.5(2) DISTRIBUTION OF ASSETS TO BE INUNDATED IN THE ANTOFAGASTA AREA(WITH)

Distribution of Buildings	Total	Residence			Shop	School	Factory	Health Center
		High	Medium	Low				
	100.0%	8.0%	33.0%	55.0%	3.0%	0.2%	0.5%	0.3%

(1) 2-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	157	13	52	86	5	0	1	0	973	1,249	0	0	2,222
2	0.25-0.5	49	4	16	27	1	0	0	0	281	361	0	0	642
3	0.5-1.0	45	4	15	25	1	0	0	0	217	278	0	0	495
4	1.0-1.5	28	2	9	15	1	0	0	0	9	12	0	0	21
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	279	22	92	153	8	1	1	1	1,480	1,900	0	0	3,380

(2) 5-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	280	22	92	154	8	1	1	1	1,707	2,190	0	0	3,897
2	0.25-0.5	67	5	22	37	2	0	0	0	389	499	0	0	888
3	0.5-1.0	27	2	9	15	1	0	0	0	118	152	0	0	270
4	1.0-1.5	24	2	8	13	1	0	0	0	4	5	0	0	9
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	398	32	131	219	12	1	2	1	2,218	2,846	0	0	5,064

(3) 10-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	373	30	123	205	11	1	2	1	2,248	2,884	0	0	5,132
2	0.25-0.5	91	7	30	50	3	0	0	0	526	674	0	0	1,200
3	0.5-1.0	42	3	14	23	1	0	0	0	190	244	0	0	434
4	1.0-1.5	27	2	9	15	1	0	0	0	11	14	0	0	25
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	533	43	176	293	16	1	3	2	2,975	3,816	0	0	6,791

(4) 20-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	284	23	94	156	9	1	1	1	1,673	2,146	0	0	3,819
2	0.25-0.5	117	9	39	64	4	0	1	0	706	906	0	0	1,612
3	0.5-1.0	152	12	50	84	5	0	1	0	928	1,191	0	0	2,119
4	1.0-1.5	47	4	16	26	1	0	0	0	81	104	0	0	185
5	1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	600	48	198	330	18	1	3	2	3,388	4,347	0	0	7,735

(5) 50-Year Return Period

No.	Water Depth (m)	Number of Buildings								Agricultural Crops (ha)				
		Total	Residence			Shop	School	Factory	Health Center	Soy-beans	Rice	Sugar cane	Maize	Total
			High	Medium	Low									
1	0.0-0.25	300	24	99	165	9	1	2	1	1,745	2,238	0	0	3,983
2	0.25-0.5	137	11	45	75	4	0	1	0	825	1,059	0	0	1,884
3	0.5-1.0	193	15	64	106	6	0	1	1	1,191	1,528	0	0	2,719
4	1.0-1.5	59	5	19	32	2	0	0	0	151	194	0	0	345
5	1.5-2.0	4	0	1	2	0	0	0	0	9	12	0	0	21
	Total	693	55	229	381	21	1	3	2	3,921	5,031	0	0	8,952

TABLE 11.2.6 ECONOMIC ANALYSIS FOR CHANE AND PAILON AREAS

1. Rio Chane Area

Unit : Bs 1,000

No.	Year	Economic Cost			Economic	(B)-(C)
		Construction	OM	Total (C)	Benefit (B)	
1	2001	0	0	0	0	0
2	2002	1,993	0	1,993	0	-1,993
3	2003	68,606	0	68,606	0	-68,606
4	2004	68,606	508	69,114	4,323	-64,791
5	2005	56,810	1,017	57,827	8,654	-49,173
6	2006	0	1,453	1,453	12,364	10,911
7	2007	0	1,453	1,453	12,364	10,911
8	2008	0	1,453	1,453	12,364	10,911
9	2009	0	1,453	1,453	12,364	10,911
10	2010	0	1,453	1,453	12,364	10,911
11	2011	0	1,453	1,453	12,364	10,911
12	2012	0	1,453	1,453	12,364	10,911
13	2013	0	1,453	1,453	12,364	10,911
14	2014	0	1,453	1,453	12,364	10,911
15	2015	0	1,453	1,453	12,364	10,911
16	2016	0	1,453	1,453	12,364	10,911
17	2017	0	1,453	1,453	12,364	10,911
18	2018	0	1,453	1,453	12,364	10,911
19	2019	0	1,453	1,453	12,364	10,911
20	2020	0	1,453	1,453	12,364	10,911
21	2021	0	1,453	1,453	12,364	10,911
22	2022	0	1,453	1,453	12,364	10,911
23	2023	0	1,453	1,453	12,364	10,911
24	2024	0	1,453	1,453	12,364	10,911
25	2025	0	1,453	1,453	12,364	10,911
26	2026	0	1,453	1,453	12,364	10,911
27	2027	0	1,453	1,453	12,364	10,911
28	2028	0	1,453	1,453	12,364	10,911
29	2029	0	1,453	1,453	12,364	10,911
30	2030	0	1,453	1,453	12,364	10,911
31	2031	0	1,453	1,453	12,364	10,911
32	2032	0	1,453	1,453	12,364	10,911
33	2033	0	1,453	1,453	12,364	10,911
34	2034	0	1,453	1,453	12,364	10,911
35	2035	0	1,453	1,453	12,364	10,911
36	2036	0	0	0	0	0
37	2037	0	0	0	0	0
38	2038	0	0	0	0	0
39	2039	0	0	0	0	0
40	2040	0	0	0	0	0
41	2041	0	0	0	0	0
	Total	196,015	45,115	241,130	383,897	142,767

EIRR (%) 3.83

Discount Rate (%)	B/C	PV(Bs 1,000) Cost	PV(Bs 1,000) Benefit	NPV (Bs. 1,000)
15	0.39	119,626	47,136	-72,490
12	0.48	133,798	64,170	-69,628
10	0.56	144,809	80,697	-64,112
5	0.88	180,742	159,258	-21,485
3	1.10	200,518	220,350	19,832

2. Rio Pailon Area

Unit : Bs 1,000

No.	Year	Economic Cost			Economic	(B)-(C)
		Construction	OM	Total (C)	Benefit (B)	
1	2001	0	0	0	0	0
2	2002	0	0	0	0	0
3	2003	111	0	111	0	-111
4	2004	1,515	0	1,515	0	-1,515
5	2005	3,975	11	3,986	258	-3,728
6	2006	62,262	22	62,284	515	-61,769
7	2007	78,574	483	79,057	11,308	-67,749
8	2008	65,393	1,066	66,459	24,958	-41,501
9	2009	79,304	1,547	80,851	36,219	-44,632
10	2010	21,923	2,153	24,076	50,407	26,331
11	2011	0	2,321	2,321	54,340	52,019
12	2012	0	2,321	2,321	54,340	52,019
13	2013	0	2,321	2,321	54,340	52,019
14	2014	0	2,321	2,321	54,340	52,019
15	2015	0	2,321	2,321	54,340	52,019
16	2016	0	2,321	2,321	54,340	52,019
17	2017	0	2,321	2,321	54,340	52,019
18	2018	0	2,321	2,321	54,340	52,019
19	2019	0	2,321	2,321	54,340	52,019
20	2020	0	2,321	2,321	54,340	52,019
21	2021	0	2,321	2,321	54,340	52,019
22	2022	0	2,321	2,321	54,340	52,019
23	2023	0	2,321	2,321	54,340	52,019
24	2024	0	2,321	2,321	54,340	52,019
25	2025	0	2,321	2,321	54,340	52,019
26	2026	0	2,321	2,321	54,340	52,019
27	2027	0	2,321	2,321	54,340	52,019
28	2028	0	2,321	2,321	54,340	52,019
29	2029	0	2,321	2,321	54,340	52,019
30	2030	0	2,321	2,321	54,340	52,019
31	2031	0	2,321	2,321	54,340	52,019
32	2032	0	2,321	2,321	54,340	52,019
33	2033	0	2,321	2,321	54,340	52,019
34	2034	0	2,321	2,321	54,340	52,019
35	2035	0	2,321	2,321	54,340	52,019
36	2036	0	2,321	2,321	54,340	52,019
37	2037	0	2,321	2,321	54,340	52,019
38	2038	0	2,321	2,321	54,340	52,019
39	2039	0	2,321	2,321	54,340	52,019
40	2040	0	2,321	2,321	54,340	52,019
41	2041	0	0	0	0	0
	Total	313,057	74,912	387,969	1,753,864	1,365,895

EIRR (%) 16.39

Discount Rate (%)	B/C	PV(Bs 1,000) Cost	PV(Bs 1,000) Benefit	NPV (Bs. 1,000)
15	1.09	113,995	123,710	9,715
12	1.32	140,389	185,826	45,438
10	1.54	162,330	250,189	87,859
5	2.46	240,911	592,633	351,722
3	3.09	287,523	887,341	599,818

TABLE 11.2.7 ECONOMIC ANALYSIS FOR SAN JUAN AND ANTOFAGASTA AREAS

1. San Juan Area

Unit : Bs.1,000

No.	Year	Economic Cost			Economic	(B)-(C)
		Construction	OM	Total (C)	Benefit (B)	
1	2001	1,417	0	1,417	0	-1,417
2	2002	7,132	11	7,143	198	-6,945
3	2003	6,649	64	6,713	1,151	-5,562
4	2004	5,426	114	5,540	2,050	-3,490
5	2005	7,170	154	7,324	2,769	-4,555
6	2006	10,651	207	10,858	3,722	-7,136
7	2007	18,433	288	18,721	5,178	-13,543
8	2008	18,539	425	18,964	7,641	-11,323
9	2009	12,227	562	12,789	10,104	-2,685
10	2010	1,539	651	2,190	11,704	9,514
11	2011	0	660	660	11,866	11,206
12	2012	0	660	660	11,866	11,206
13	2013	0	660	660	11,866	11,206
14	2014	0	660	660	11,866	11,206
15	2015	0	660	660	11,866	11,206
16	2016	0	660	660	11,866	11,206
17	2017	0	660	660	11,866	11,206
18	2018	0	660	660	11,866	11,206
19	2019	0	660	660	11,866	11,206
20	2020	0	660	660	11,866	11,206
21	2021	0	660	660	11,866	11,206
22	2022	0	660	660	11,866	11,206
23	2023	0	660	660	11,866	11,206
24	2024	0	660	660	11,866	11,206
25	2025	0	660	660	11,866	11,206
26	2026	0	660	660	11,866	11,206
27	2027	0	660	660	11,866	11,206
28	2028	0	660	660	11,866	11,206
29	2029	0	660	660	11,866	11,206
30	2030	0	660	660	11,866	11,206
31	2031	0	660	660	11,866	11,206
32	2032	0	660	660	11,866	11,206
33	2033	0	660	660	11,866	11,206
34	2034	0	660	660	11,866	11,206
35	2035	0	660	660	11,866	11,206
36	2036	0	660	660	11,866	11,206
37	2037	0	660	660	11,866	11,206
38	2038	0	660	660	11,866	11,206
39	2039	0	660	660	11,866	11,206
40	2040	0	660	660	11,866	11,206
41	2041	0	0	0	0	0
	Total	89,183	22,276	111,459	400,495	289,036
		70,995				

EIRR (%) 12.37

Discount Rate (%)	B/C	PV(Bs. 1,000) Cost	PV(Bs. 1,000) Benefit	NPV (Bs. 1,000)
15	0.84	41,035	34,532	-6,504
12	1.03	48,072	49,351	1,280
10	1.20	53,816	64,394	10,578
5	1.92	73,983	142,340	68,356
3	2.43	85,835	208,321	122,486

2. Antofagasta Area

Unit : Bs.1,000

No.	Year	Economic Cost			Economic	(B)-(C)
		Construction	OM	Total (C)	Benefit (B)	
1	2001	2,462	0	2,462	0	-2,462
2	2002	12,384	20	12,404	650	-11,754
3	2003	9,337	111	9,448	3,605	-5,843
4	2004	5,975	181	6,156	5,878	-278
5	2005	13,281	226	13,507	7,340	-6,167
6	2006	8,569	324	8,893	10,522	1,629
7	2007	6,898	387	7,285	12,568	5,283
8	2008	9,700	439	10,139	14,257	4,118
9	2009	11,352	511	11,863	16,596	4,733
10	2010	3,559	595	4,154	19,324	15,170
11	2011	0	619	619	20,103	19,484
12	2012	0	619	619	20,103	19,484
13	2013	0	619	619	20,103	19,484
14	2014	0	619	619	20,103	19,484
15	2015	0	619	619	20,103	19,484
16	2016	0	619	619	20,103	19,484
17	2017	0	619	619	20,103	19,484
18	2018	0	619	619	20,103	19,484
19	2019	0	619	619	20,103	19,484
20	2020	0	619	619	20,103	19,484
21	2021	0	619	619	20,103	19,484
22	2022	0	619	619	20,103	19,484
23	2023	0	619	619	20,103	19,484
24	2024	0	619	619	20,103	19,484
25	2025	0	619	619	20,103	19,484
26	2026	0	619	619	20,103	19,484
27	2027	0	619	619	20,103	19,484
28	2028	0	619	619	20,103	19,484
29	2029	0	619	619	20,103	19,484
30	2030	0	619	619	20,103	19,484
31	2031	0	619	619	20,103	19,484
32	2032	0	619	619	20,103	19,484
33	2033	0	619	619	20,103	19,484
34	2034	0	619	619	20,103	19,484
35	2035	0	619	619	20,103	19,484
36	2036	0	619	619	20,103	19,484
37	2037	0	619	619	20,103	19,484
38	2038	0	619	619	20,103	19,484
39	2039	0	619	619	20,103	19,484
40	2040	0	619	619	20,103	19,484
41	2041	0	0	0	0	0
	Total	83,517	21,364	104,881	693,830	588,949
		81,794				

EIRR (%) 23.45

Discount Rate (%)	B/C	PV(Bs. 1,000) Cost	PV(Bs. 1,000) Benefit	NPV (Bs. 1,000)
15	1.52	43,269	65,928	22,659
12	1.86	49,505	92,103	42,599
10	2.17	54,550	118,410	63,860
5	3.51	72,120	253,004	180,884
3	4.44	82,435	366,043	283,608

CHAPTER 12

CONCLUSION AND RECOMMENDATION

CHAPTER 12 CONCLUSION AND RECOMMENDATION

The proposed flood mitigation and drainage improvement plans for the Feasibility Study have been designed and evaluated from technical, economic, social and environmental aspects. The proposed flood mitigation and drainage improvement plans are concluded to be feasible in technical, economic, social and environmental terms and to enable the Study area to alleviate flood and drainage problems and to stabilize the area. It is recommended for the Department of Santa Cruz to take immediate actions for the followings:

(1) To implement the structural and non-structural measures proposed in the Study for alleviation of flood and drainage problems, taking immediate action for implementation of the measures proposed to be the 1st priority order.

(2) To reinforce the existing meteorological and hydrological network for establishment of an effective flood warning system in the northern region of Santa Cruz, including installation of three automatic rain gauges and one water level gauge,

(3) To strengthen the General Coordination Directions as the leading implementation organization for the project for early and smooth implementation of the proposed flood mitigation and drainage improvement measures in function and manpower,

(4) To take immediate actions to conserve the retarding basins proposed in the Study because of a high efficiency for alleviation of flood problems in the area,

(5) To guide the farmer to follow appropriate cropping calendars or farming systems due to the existing soil and flood conditions based on the flood hazard area maps and land used zoning maps for alleviation of flood damages in the agricultural crops,

(6) To utilize the coordination committee effectively for enhancement of public participation in flood mitigation activities.

APPENDIX A

LIST OF COUNTERPARTS

AND STUDY TEAM

APPENDIX A LIST OF COUNTERPARTS AND STUDY TEAM

1. COUNTERPARTS

Tito Guido Rojas	Head of Planning Division
Mario Ribera	UTD-PLUS
Juan de Dios Algarañaz	UTD-PLUS
Nicolás Andrade C.	Pre-investment
María Dolores Chávez	Popular Participation Division
René Camacho Mérida	Pre-investment
Walter Colbert Perez	UTD-PLUS
Aly W. Zabara	Planning Division
Patricia Mendez Suárez	UTD-PLUS
Oscar Callaú	Infrastructure Division
Rodolfo Candia	Planning Division
Wilfredo Rojo	Municipality Support Division
Oscar Valdivieso	Infrastructure Division
Fernando Valdés	Infrastructure Division
Ricardo Paredes	SEARPI
Ronald Alvarez	SEARPI
Pilar Dávalos	Planning Division
Armando Guzmán	Natural Resources Division
Osvaldo Burgos	Environment Division
Jorge Montaño	SENAMHI

2. JICA STUDY TEAM

Hajime TANAKA	Team Leader/Flood Control Plan
CHAISAK Sripadungtham	Facilities Design/Soil Investigation
Kazuhiro TSUCHIDA	Drainage Plan/Agricultural conservation
Lyrio Massaru NAKASE	Hydrologist/Hydraulics/Flood Analysis
Masakazu UOCHI	Construction Plan/Cost Estimation
Kinichi OHNO	Socio-economic
Michiaki HOSONO	Environment/Land Use
Takehiko HIRANO	Topographic Survey
Tadashi TANIMOTO	Organization/Institution
Kenichiro KATO	Coordinator

APPENDIX B

MINUTES OF MEETING

MINUTES OF MEETING
ON
THE INCEPTION REPORT
FOR
THE FEASIBILITY STUDY ON FLOOD CONTROL IN THE NORTHERN RURAL REGION OF SANTA CRUZ IN THE REPUBLIC OF BOLIVIA

SANTA CRUZ, AUGUST 4, 1998
LA PAZ, AUGUST , 1998

ZVONKO MATKOVIC FLEIG
PREFECTO
PREFECTURA OF SANTA CRUZ

HAJIME TANAKA
TEAM LEADER
STUDY TEAM OF
JAPAN INTERNATIONAL
COOPERATION AGENCY

NEISA ROCA HURTADO
VICE-MINISTER OF
ENVIRONMENT, NATURAL RESOURCES
AND FOREST DEVELOPMENT
MINISTRY OF SUSTAINABLE
DEVELOPMENT AND PLANNING

SHOSHIRO HORIGOME
CHAIRMAN
ADVISORY COMMITTEE OF
JAPAN INTERNATIONAL
COOPERATION AGENCY

OSWALDO ANTEZANA VACA DIEZ
MINISTER
MINISTRY OF AGRICULTURE,
CATTLE AND RURAL DEVELOPMENT

MIGUEL LOPEZ BAKOVIC
VICE-MINISTER
PUBLIC INVESTMENT AND
EXTERNAL FINANCE
MINISTRY OF FINANCE

The Study Team of Japan International Cooperation Agency (JICA) submitted the Inception Report (July 1998) for the captioned project to the Ministry of Sustainable Development and Planning, the Ministry of Agriculture, Cattle and Rural Development and the Ministry of Finance on July 29, 1998. The Study Team explained the basic concept and outline of the report to the officials concerned and each ministry showed its satisfaction to the basic concept of the report. The Study Team asked each ministry to collect comments, if any, and to send to the Study Team in Santa Cruz by July 31, 1998.

The Study Team submitted the Report to the Prefectura of Santa Cruz on July 30, 1998, according to the Scope of Work agreed upon between the Prefectura of Santa Cruz and JICA on November 14, 1997. At the submission of the report, the Director of the Sustainable Development Direction of the Prefectura of Santa Cruz introduced the counterpart personals assigned to the Study to the Study Team. The counterpart team member list is shown in Annex-2.

The Study Team held a series of meetings with the Prefectura of Santa Cruz on the Report on July 30-31, 1998. The study program and work proposed in the Report was explained by the Study Team to the officials concerned on July 30 and discussed between the Study Team and the officials on July 31. During the meetings the importance raised and discussed among the participants was as follows:

1. Both, the Rio Grande and Rio Pirai have strong effects on the Study area and these effects should be considered in the Study. The Study Team will consider them for the Study.

2. In relation to the Rio Grande, a study for flood mitigation and basin management should be developed by the Prefectura of Santa Cruz, as proposed in the last Master Plan Study. The importance of an early execution of the study was agreed among the participants.

3. The water level data and other information collected by SEARPI should be considered for flood condition evaluation of the Rio Chane. The Study Team agreed to use the available data from SEARPI for the Study.

The Advisory Team of JICA, headed by Mr. Shoshiro HORIGOME, visited Bolivia from August 3 to 8. The Advisory Team and the Study Team held a meeting with the Prefectura of Santa Cruz on the Report on August 3, 1998. The authority of the Prefectura of Santa Cruz expressed its satisfaction to the Report.

Through these meetings some observation were made and discussed by the participants on effective

ways of technical transfer through the study and also public participation to the Study. The points discussed and agreed were summarized as follows:

1. The Prefectura of Santa Cruz accepted the Inception Report without fundamental changes.
2. The Prefectura of Santa Cruz will organize a coordinating committee for the Study as soon as possible based on the Minutes of Meeting for the Study signed on November 14, 1997.
3. The Prefectura of Santa Cruz will assign necessary number of counterparts to the Study in order to conduct the Study successfully.
4. The Study Team will provide periodically the counterpart team with study programs for smooth cooperation.
5. The Advisory Team agreed to transfer to the JICA headquarter the request by the Prefectura of Santa Cruz for counterpart training in Japan.

The list of participants is shown in Annex-1.

Annex – 1

PARTICIPANTES LIST
MEETING ON INCEPTION REPOR

BOLIVIAN SIDE

1.- Walter Colbert Perez	UTD-PLUS
2.- Nicolas Andrade Catacora	Pre-investment División
3.- René Camacho Merida	Pre-investment Division
4.- Mario Ribera Velez	UTD-PLUS
5.- Jose Sucre Guzmán	Pre-investment Division
6.- Aly Zabala Lozano	Planning Division
7.- Pilar Dávalos de Mansilla	Planning Division
8.- Juan de Dios Algarañaz Rodriguez	UTD-PLUS
9.- Rodolfo Candia Castillo	Plannning Division
10.-Tito Guido Rojas	Planning Division
11.-Edmundo Justiniano Escalante	SEARPI
12.-Patricia Mendez Suarez	UTD-PLUS
13.-Masaharu Torii	JICA Expert

JAPANESE SIDE

Advisory Team

1.-Shoshiro HORIGOME	Chairman of Advisory Committee
2.-Hideo MATSUMOTO	Member of Advisory Committee (Flood Control Plan)
3.-Masami HIRAYAMA	Member of Advisory Committee (Agricultural Land Consrvation)
4.-Masaru NAKAMOTO	JICA Headquater

JICA Study Team

1.-Hajime TANAKA	Team Leader / Flood Control Plan
2.-CHAISAK Sripadungtham	Facility Design / Soil Investigation
3.-Kazuhiro TSUCHIDA	Drainage Plan / Agricultural Conservation
4.-LyrioMassaru NAKASE	Hydrology / Hydraulics / Flood Analysis
5.- Kinichi OHNO	Socio-economy

JICA Bolivia Office

1.-Hiroshi NISHIKI	Economic Sector
2.-Carlos OMOYA	Technical Cooperation

Annex - 2

LIST OF COUNTERPARTS

NAME	SPECIALITY
Mario Ribera	Flood Control Plan /Hydrology and Hydraulics/ Flood Analysis
Juan de Dios Algarañaz	Drainage Improvement / Agricultural Land Conservation
Ricardo Paredes	Hydrology and Hydraulics / Flood analysis
Rodolfo Candia	Construction plan / cost estimation
Walter Colbert	Socio – Economy
Patricia Mendez	Environment / Land use / Topographic Survey
Pilar Davalos	Environment / Land use / Organization and institution

MINUTES OF MEETING
ON
PROGRESS REPORT
FOR
THE FEASIBILITY STUDY ON FLOOD CONTROL IN THE NORTHERN RURAL REGION OF SANTA CRUZ IN THE REPUBLIC OF BOLIVIA

SANTA CRUZ, OCTOBER 27, 1998
LA PAZ, OCTOBER 29, 1998

FREDDY TERRAZAS SALAS

PREFECTO
PREFECTURA OF SANTA CRUZ

HAJIME TANAKA

TEAM LEADER
STUDY TEAM OF
JAPAN INTERNATIONAL
COOPERATION AGENCY

NEISA ROCA HURTADO

VICE-MINISTER OF
ENVIRONMENT, NATURAL RESOURCES
AND FOREST DEVELOPMENT
MINISTRY OF SUSTAINABLE
DEVELOPMENT AND PLANNING

ALBERTO VALDES

VICE-MINISTER OF
PUBLIC INVESTMENT AND
EXTERNAL FINANCE
MINISTRY OF FINANCE

OSWALDO ANTEZANA VACA DIEZ

MINISTER
MINISTRY OF AGRICULTURE,
CATTLE AND RURAL DEVELOPMENT

The Study Team of the Japan International Cooperation Agency (JICA) submitted the Progress Report (October 1998) for "the Feasibility Study on Flood Control in the Northern Rural Region of Santa Cruz in the Republic of Bolivia" to the Prefectura of Santa Cruz on October 26, 1998, according to the Scope of Work agreed upon between the Prefectura of Santa Cruz and JICA on November 14, 1997.

The Study Team arrived at the end of July 1998 and has commenced the Study since August 1998, after explanation of the study plan shown in the Inception Report (July 1998). The Progress Report presents the findings during the Study in Bolivia from August through October 1998.

The Study Team held a meeting with the official concerned of the Prefectura of Santa Cruz on the Progress Report on October 26, 1998. Sr. Rafael Soto P., Director of Sustainable Development Direction, chaired the meeting. The Study Team presented the initial findings and the results of the preliminary analysis conducted in the Study and discussed on the opinions and comments raised by the attendants on the report.

At the end of the meeting the Study Team proposed the Chairman and the attendants that the further opinions and comments on the Report shall be collected from the attendants and related organization by Sustainable Development Direction and sent to the Study Team within one month and they will be incorporated into the next report. The Chairman noticed that the opinions and comments, if any, should be submitted in written form to Lic. Tito Guido Rojas, Chief of Planning Division and that the Planning Division will send them to the Study Team by the end of November 1998.

Before closing the meeting the Chairman expressed his satisfaction to the report and the presentation. During the meeting the points discussed and agreed by the attendants were as follows:

1. The Progress Report (October 1998) was accepted without any special comments.
2. The Study Team requested the Prefectura of Santa Cruz to keep the Counterpart Team to cooperate with the Study Team until the end of the Study in order to

attain the objectives of the Study successfully. The Chairman agreed to pay a best effort to keep it.

3. The Counterpart Team proposed that it would be important to keep close communication between the Study Team and the Counterpart Team. The Study Team agreed to keep communication with the Counterpart Team on regular bases by the e-mail or fax. The e-mail numbers of the Study Team and the Counterpart Team are given as follows:

The Study Team

Hajime Tanaka	:	tanakah@pcitokyo.co.jp
c.c. Michiaki Hosono	:	hosonom@pcitokyo.co.jp
c.c. Kazuhiro Tsuchida	:	tsuchik@pcitokyo.co.jp

The Counterpart Team

UTDPLUS	:	UTDPLUS@HOTMAIL.com

The list of participants and the list of the Counterpart Team are shown in Annex-1 and Annex–2 respectively.

THE FEASIBILITY STUDY ON FLOOD CONTROL IN THE NORTHERN RURAL REGION OF SANTA CRUZ IN THE REPUBLIC OF BOLIVIA

MEETING

OCTOBER 26, 1998

BOLIVIAN COUNTERPART

	NAME	DEPARTMENT OR DIVISION
1	Mario Ribera	UTD-PLUS
2	Juan de Dios Algarañaz	UTD-PLUS
3	Nicolás Andrade C.	Pre-Investment
4	Rafael Soto Pinto	Sustainable Development Direction Director
5	Arq. María Dolores Chávez	Popular Participation Division
6	Lic. René Camacho Mérida	Pre-Investment
7	Walter Colbert Pérez	UTD-PLUS
8	Aly W. Zabala	Planning Division
9	Patricia Méndez Suárez	UTD-PLUS
10	Oscar Callaú	Infrastructure Division
11	Tito Guido Rojas	Head of Planning Division
12	Elizabeth Rosetti Saldaña	Professional for Support UPP

JICA STUDY TEAM

1	Hajime Tanaka	Study Team
2	Michiaki Hosono	Study Team
3	Kazuhiro Tsuchida	Study Team
4	Chaisak Sripadungtham	Study Team
5	Masakazu Uochi	Study Team
6	Kenichiro Kato	Study Team

THE FEASIBILITY STUDY ON FLOOD CONTROL IN THE NORTHERN RURAL REGION OF SANTA CRUZ IN THE REPUBLIC OF BOLIVIA

LIST OF COUNTERPARTS

	NAME	DEPARTMENT OR DIVISION
1	Tito Guido Rojas	Head of Planning Division
2	Mario Ribera	UTD-PLUS
3	Juan de Dios Algarañaz	UTD-PLUS
4	Nicolás Andrade C.	Pre-Investment
5	Arq. María Dolores Chávez	Popular Participation Division
6	Lic. René Camacho Mérida	Pre-Investment
7	Walter Colbert Perez	UTD-PLUS
8	Aly W. Zabala	Planning Division
9	Patricia Mendez Suárez	UTD-PLUS
10	Oscar Callaú	Infrastructure Division
11	Rodolfo Candia	Planning Division
12	Wilfredo Rojo	Municipal Suport
13	Oscar Valdivieso	Large Projects
14	Fernando Valdés	Infrastructure Division
15	Ricardo Paredes	SEARPI
16	Ronald Alvarez	SEARPI
17	Lic. Pilar Dávalos	Planning Division
18	Armando Guzmán	Natural Resources Division
19	Osvaldo Burgos	Environment Division
20	Jorge Montaño	SENAMHI

MINUTES OF MEETING
ON
DRAFT FINAL REPORT
FOR
THE FEASIBILITY STUDY ON FLOOD CONTROL IN THE NORTHERN RURAL REGION OF SANTA CRUZ IN THE REPUBLIC OF BOLIVIA

SANTA CRUZ, MARCH 25, 1999
LA PAZ, MARCH 26, 1999

FREDDY TERRAZAS SALAS
Prefecto
Prefectura Of Santa Cruz

HAJIME TANAKA
Team Leader
Study Team Of
Japan International
Cooperation Agency

NEISA ROCA HURTADO
Vice-Minister Of
Environment, Natural Resources
And Forest Development
Ministry Of Sustainable
Development And Planning

KENJI KIYOMIZU
Chairman
Advisory Committee Of
Japan International
Cooperation Agency

OSWALDO ANTEZANA VACA DIEZ
Minister
Ministry Of Agriculture,
Cattle And Rural Development

ALBERTO VALDES
Vice-Minister Of
Public Investment And
External Finance
Ministry Of Finance

The Study Team of the Japan International Cooperation Agency (JICA) submitted the Draft Final Report (March 1999) for "the Feasibility Study on Flood Control in the Northern Rural Region of Santa Cruz in the Republic of Bolivia" to the Prefectura of Santa Cruz on March 18, 1999, according to the Scope of Work agreed upon between the Prefectura of Santa Cruz and the JICA on November 14, 1997. The Draft Final Report presents the results of the Study both in Bolivia from August to October 1998 and in Japan from November to March 1999.

The Study Team arrived in La Paz on March 17, 1999 and presented a brief explanation of the Draft Final Report to the Ministries concerned, i.e., Ministry of Sustainable Development and Planning, Ministry of Agriculture, Cattle and Rural Development and Ministry of Finance, and after that, moved to Santa Cruz on March 18, 1999.

The Study Team held a series of meetings on the Draft Final Report with the officials concerned in the Prefectura of Santa Cruz on March 19 and 22, 1999. Arq. Manfredo Arias Terrazas, Chief of Public Investment and Projects Area of the Strategic Planning Division, chaired the meetings. The Study Team presented an outline of the Report on March 19 and discussed with the attendants on the opinions and comments raised on the Report, on March 22, 1999.

At the end of the meeting the Study Team proposed the Chairman and the attendants that the further opinions and comments on the Report, if any, shall be sent to the Study Team through JICA Bolivia office within one month, which will be considered in the Final Report. The Chairman noticed that the opinions and comments, if any, should be submitted in written form to the Strategic Planning Division of the General Coordination Direction of the Department of Santa Cruz and that the General Coordination Direction will send them to JICA Bolivia office.

Before closing the meeting the chairman and the attendants expressed their satisfaction on the Study and the Report. During the meeting the points discussed and agreed by the attendants are as follows:

1. The Draft Final Report (March 1999) was accepted in principle without any special comments.
2. The Prefectura of Santa Cruz agreed to send the comments, detailed observations and opinions on the Draft Final Report before April 16 to JICA Bolivia office.
3. The Government of Bolivia expressed its concern on the financial sustainability of the project. Therefore, the Government of Bolivia recommended to include in the Final

Report an alternative and detailed implementation schedules of the works and the costs according to municipal jurisdictions to enable to analyze financing of the counter budget and possible financial sources. The Study Team agreed to add an alternative implementation schedule and also implementation schedules of the works for the Prefectura and each municipality in the Final Report considering this recommendation.

4. The Prefectura of Santa Cruz promised to implement the priority non-structural measures proposed in the Study and also requested JICA for further technical support for preparation of implementation of the priority measures proposed in the Study. The Advisory Committee agreed to transfer it to the JICA headquarters.
5. The Study Team requested the Prefectura of Santa Cruz to keep the counterpart team including the necessary additional counterpart for implementation of the results of the Study in order to attain the objectives of the Study successfully. The Prefectura accepted to consider it positively.
6. The Prefectura of Santa Cruz proposed that it would be important to prepare a brief explanatory paper or pamphlet to promote public participation. The Study Team agreed to discuss it with the JICA headquarters.

The Prefectura of Santa Cruz informed the Study Team about the activities being conducted for the Rio Grande. The Prefectura has initiated emergency actions for the Rio Grande and will organize a technical committee for the preparation of a master plan of the basin.

The list of participants is shown in Annex-1.

Annex-1 **List of Participants for the Meetings on Draft Final Report**

Bolivian side

1.- Manfredo Arias Terrazas	Chief of Public Investment and Projects Area of the Strategic Planning Division
2.- Tito Guido Rojas	Chief of Strategic Planning Division
3.- Walter Colbert Perez	UTD-PLUS
4.- René Camacho Merida	Public Investment and Projects Area
5.- Mario Ribera Velez	UTD-PLUS
6.- Aly Zabala Lozano	Strategic Planning Division
7.- Pilar Dávalos de Mansilla	Strategic Planning Division
8.- Juan de Dios Algarañaz Rodriguez	UTD-PLUS
9.- Rodolfo Candia Castillo	Strategic Planning Division
10.- Edmundo Justiniano Escalante	SEARPI
11.- Patricia Méndez Suárez	UTD-PLUS
12.- Oscar Callaú Barbery	Irrigation Division
13.- Olga Suárez Justiniano	Prefectura Protocol
14.- Nicolás Andrade Catacora	Public Investment and Projects Area

Japanese side

Advisory Committee

1.- Kenji Kiyomizu	Chairman of Advisory Committee

JICA Study Team

1.-Hajime Tanaka	Team Leader / Flood Control Plan
2.-Kazuhiro Tsuchida	Drainage Plan / Agricultural Conservation
3.-Michiaki Hosono	Environment/Land use

JICA Bolivia Office

1.-Carlos Omoya	Technical Cooperation

APPENDIX C

COORDINATION COMMITTEE

REPUBLICA DE BOLIVIA
PREFECTURA DEL DEPARTAMENTO
SANTA CRUZ

PREFECTURA DEL DEPARTAMENTO
DIRECCION
JURIDICA
Santa Cruz

RESOLUCION PREFECTURAL No.- 589/98
Santa Cruz, 24 agosto de 1998

VISTOS Y CONSIDERANDOS:

Que, la vigente Ley 1654 de Descentralización Administrativa, promulgada el 28 de julio de 1995 establece en su art. 5 (atribuciones del Prefecto) inc. m) Dictar resoluciones administrativas, suscribir contratos y convenios, delegar y desconcentrar funciones técnico-administrativas.

Que, el Decreto Supremo 24833 que norma la Estructura Orgánica de las Prefecturas de Departamento, confiere en su art. 16 (Director Departamental de Desarrollo Social) inc.e) Cooperar a los Municipios en sus planes y programas de fortalecimiento institucional, desarrollo urbano y comunitario.

Que, vistas las inundaciones que se producen reiteradamente en la región norte del Departamento de Santa Cruz y examinado el Estudio de El Plan Maestro Sobre el control de Inundaciones de la Región Rural Norte de Santa Cruz y los acuerdos Intergubernamentales que el Gobierno Nacional suscribió con la Agencia de Cooperación Internacional del Japón sobre el tema (acuerdo sobre el control de inundaciones en la región rural norte de Santa Cruz, suscrito en La Paz el 14 de noviembre de 1997) acordando que la Prefectura debe promover el desarrollo sostenible de la región, asegurando la preservación del patrimonio en beneficio directo de las generaciones presente y futuras.

Que, existiendo el Plan Maestro de Control de inundaciones elaborado por la Prefectura del Departamento y la Agencia de Cooperación Internacional del Japón (JICA), por ello que se hace necesaria la participación de la sociedad civil en las acciones del Estado que atañen a su labor.

POR TANTO:

El Prefecto del Departamento en uso de sus atribuciones conferidas por LA CONSTITUCION POLITICA DEL ESTADO, Ley de Descentralización Administrativa y Decreto Reglamentario.

RESUELVE:

Artículo Primero.- Se autoriza la creación del Comite Coordinador del Plan Maestro de Control de Inundaciones en la Región Rural Norte de Santa Cruz.

REPUBLICA DE BOLIVIA
PREFECTURA DEL DEPARTAMENTO
SANTA CRUZ

Artículo Segundo.- Este comite considerara ,las propuestas técnicas, emanadas del Estudio de factibilidad que lleva adelante la Prefectura con la cooperación japonesa, con el objeto de introducir los criterios de los beneficios del Plan Maestro, en as actuaciones formuladas en los proyectos que se desarrollaran en las áreas priorizadas por el Plan Maestro.

Artículo Tercero.- El comite Coordinador estará constituido por

Institución	Representante
PREFECTURA DE DEPARTAMENTO	Prefecto
SEARPI	Director Ejecutivo
ALCADIA OKINAWA	Alcalde Municipal
SUBPREFECTURA O. SANTISTEVAN	Subprefecto
SUBPREFECTURA WARNES	Subprefecto
PRODUCTORES OKINAWA	CAICO
PRODUCTORES SAN JUAN DE YAPACANI	CAISY
MANCOMUNIDAD DE MUNICIPIOS ICHILO	Presidente
MANCOMUNIDAD DE MUNICIPIOS O.SANTISTEVAN	Presidente
DIRECCION DE INFRAESTRUCTURA	Director
ALCALDÍA COTOCA	Alcalde Municipal
SUBPREFECTURA ICHILO	Subprefecto
ASOCIACION BOL. JAPONESA (OKINAWA)	Presidente
ASOCIACION BOL. JAPONES (SAN JUAN)	Presidente

Artículo Cuarto.- El comite coordinador estructurara su propia organización adecuada para los fines de su creación.

Es dada en el Palacio Prefectural a los veinticuatro días del mes de agosto de mil novecientos noventa y ocho años.

ARCHIVESE, COMUNIQUESE Y CUMPLASE.

Dr. Miguel A. Fleury Parada
DIRECTOR JURIDICO DEPARTAMENTAL
Reg. C.S.J. 249 - C.A.788
Prefectura del Departamento
Santa Cruz - Bolivia

Lic. Ernesto Matkovic Heig
PREFECTO DEL DEPARTAMENTO
Santa Cruz - Bolivia

OPERATION REGULATIONS OF THE COORDINATION AND FOLLOW UP COMMITTEE OF THE MASTER PLAN OF DRAINAGE IN THE NORTH AREA

ANTECEDENTS:

Despite of the bad weather in Santa Cruz area, the rural northern area of the department of Santa Cruz has developed significantly because of the abundant natural resources and large plain and fertile areas with a high agriculture and livestock potential, at the time is the most important agriculture and industrial area in the nation.

In spite of being a susceptible area to inundation, caused by floods and sporadic heavy rainfalls like the ones in 1983 and 1992 that in many times damaged the rural and urban areas, the Bolivian government requested to the Japanese government a technical assistance to manage these problems, having as a result the cooperation of "The Master Plan Study on Flood Control in the Northern Rural Region of Santa Cruz in the Republic of Bolivia", in this plan there are two priority areas in which is going on the Feasibility Study, also with the assistance of JICA.

OBJECTIVES:

The main objective of the Coordination Committee is to prepare for an easy implementation of the project, it should play the following main roles:

In the feasibility stage:

- Provide opinions and suggestions on the study. Coordinate the propositions and opinions of the members.
- Inform about the contents of the project and works to the inhabitants of the study area.

In the follow up stage:

- Support the Prefectura of Santa Cruz for an early implementation of the project.
- Coordinate the relationship between the Committee and the inhabitants of the study area.

In the implementation stage:

- Support in the organization for the implementation of the project.
- Coordinate the relationship between the Committee and the inhabitants of the study area.

CHAPTER I
GENERAL ARRANGEMENTS

ARTICLE 1.- The Committee of Coordination and Follow Up of the Master Plan of Drainage in the Northern Area, is a deliberative and advise organ for coordination of actions in the time of the development of the projects of the Master Plan of Drainage, in order to achieve people's participation in decision making during the execution process of the M/P and to do everything possible for an early implementation.

ARTICLE 2.- The functions are of permanent character, which will be performed by the representatives of Prefectura, SEARPI, Alcaldía of Okinawa, Subprefectura of Obispo Santistevan, Subprefectura of Warnes, Okinawa Farmers, San Juan de Yapacaní Farmers, MACUCY, Obispo Santistevan Municipios Union, Infrastructure Direction, Alcaldía of Cotoca, Subprefectura of Ichilo, Bolivian-Japanese Union of Okinawa, Bolivian-Japanese Union of San Juan.

ARTICLE 3.- The infrastructure and administrative support for the legal function of the Committee, will be provided by the Prefectura of the Department, according to its budget possibilities.

CHAPTER II
ABOUT THE MEMBERS OF THE COMMITTEE

ARTICLE 4.- In accordance with the prefectural resolution N°589/98, August 24, the following members will be conforming the committee.

Two representatives of the Prefectura.
One representative of SEARPI.
One representative of the Alcaldía of Okinawa.
One representative of the Subprefectura of Ichilo.
One representative of the Subprefectura O. Santistevan.
One representative of the Subprefectura of Warnes.
One representative of the Okinawa Farmers.
One representative of the San Juan Farmers.
One representative of Surutú Municipios Union (MACUCY).
One representative of the O. Santistevan Municipios Union.
One representative of the Alcaldía of Cotoca.
One representative of Bolivian-Japanese Union of Okinawa.

One representative of Bolivian-Japanese Union San Juan.
One representative of the Infrastructure Direction

ARTICLE 5.-In order to guarantee the legit representation in the functioning of the committee, a Board of Directors will be elected, this should be conformed by a President, a Vice-President, and three members; elected by direct vote by all the members of the committee.

ARTICLE 6.- The Executive Director of the M/P will be the Secretary of the Committee as an operative representant of the Prefectura, with only right of voice.

CHAPTER III
ABOUT THE FUNCTIONS AND ATTRIBUTIONS OF THE COMMITTEE

ARTICLE 7.- Functions and attributions of the Committee.

7.1. ABOUT THE SUPERVISION

a. To require from the Executive Director of the M/P in written form, financial and physical progress reports of the feasibility study.
b. During the feasibility study execution, a follow up and vigilance process will be done, watching for the fulfillment the agreements. In case of any observations or amendments, these would have to be proposed by consensus of the Committee to the Executive.
c. The supervision by the Committee will be done through mandatory and periodic meetings, with the responsible implementation organization of the project.

7.2. GENERAL ACTIVITIES

a. The Committee is in charge to inform to each and every member of the Committee, in their particular areas, the projects and actions developed by the Plan in order to achieve the most people's participation.
b. The Committee will support any activity done by the Prefectura and Municipal Governments in their search for financial sources for the investment on the projects defined by the Feasibility Study.
c. The Committee will watch for the obligations subscribed by the institutions, mainly the financial contributions of every one.

CHAPTER IV
ABOUT THE REQUIREMENTS AND OBLIGATIONS OF THE MEMBERS OF THE COMMITTEE

ARTICLE 8.- Members of the Committee are the delegates accredited by the institutions assigned by the Prefectural Resolution N° 589/98 as well as the ones that this Committee invites to join, whenever it is convenient to add a relevant sector during the development of the Plan.

ARTICLE 9.- The members of the Committee are accredited by their respective institutions through an official document from their main directors, in order to certify the fulfillment of ARTICLE 8 of the present regulation.

ARTICLE 10.- The legitimacy and election procedure of the members of each particular institution to the Committee is of sole responsibility of every institution.

ARTICLE 11.- The members of the Committee will work through it. The members are not to allowed to act by themselves in any technical, financial nor administrative activities of the implementation organization of the project.

ARTICLE 12.- It is an obligation of the members of the Committee to attend to the ordinary and extraordinary meetings.

ARTICLE 13.- More than three continuos not justified absences will require an explanation about them.

CHAPTER V
ABOUT THE RESPONSIBILITIES

ARTICLE 14.- The President and the other members of the Committee are responsible in joint manner of the decisions taken in the meetings, unless that their dissenting position and fundaments is written in the minutes of meeting.

ARTICLE 15.- The meetings of the Committee could be ordinary or extraordinary. The ordinary are the ones programmed every two months and extraordinary the ones called for urgent matters whose importance requires the meetings.

ARTICLE 16.- The Committee will meet in an ordinary manner convoked by the President and in an extraordinary manner the times that the Presidents decides it or when it is required in written form, specifying the subjects to deal with, by a minimum of five members of the Committee. In the case of extraordinary meetings, the convocation should have the subject matters of the meeting and the meeting should only deal with those specific matters.

ARTICLE 17.- The meetings will be convoked by the President through the Secretariat of the Committee, in written form and with a minimum of seven days in advance and the extraordinary meetings will be convoked in written form

with a minimum of 48 hours in advance, using the most adequate communication means according to the urgency of the meeting.

ARTICLE 18.- The Committee should establish by consensus the priority, day, hour and duration of the ordinary meetings.

ARTICLE 19.- The meetings will be presided by the President of the Committee or his representative and in the case of the absence of both of them by the Vice-President, having this one the same attributions of the former.

ARTICLE 20.- The Executive Director of the feasibility study will attend to all the meetings of the Committee to inform of the progress of the study and answer to all the observations that they could have.

ARTICLE 21.- The quorum of the meetings of the Committee is made up of the President or his representative and eight members. If the quorum is not met and if an emergency exists, the subject matters could be discussed in Grand Commission ad referendum and be approved in the next meeting when the mandatory quorum is met.

ARTICLE 22.- The decisions of the Committee can be in forced, when the absolute majority of the members with right to vote have approved them. The members can not vote in blank and can not abstain themselves from voting. If one of them does not agree with the decision, he has to explain his reasons which will be written in the minutes of meeting.

ARTICLE 23.- The resolutions approved by the Committee should be made public to the institutions that will be in charge of their fulfillment.

ARTICLE 24.- Minutes of Meetings of the Committee will be written, in which all the agreements and resolutions taken over the subject matters that were discussed are included. These Minutes of Meeting shall be numbered and dated; the elaboration, follow up for approval, subscription, record and custody will be in charge of the Secretary of the Committee.

ARTICLE 25.- The Minutes of Meeting will be valid when the members of the Committee that were present in that respective meeting sign them.

CHAPTER VI
ABOUT THE DEVELOPMENT OF THE MEETINGS

ARTICLE 26.- At the beginning of the meeting, the President shall explain the matters in the order of the day with the respective justifications and backgrounds, and afterwards allowing the members of the Committee to express themselves

over the matter. The members of the Committee have the right to talk with a previous request and approval of the President.

ARTICLE 27.- The matters shall be discussed until reaching consensus, if the consensus is not reached, the President will say that the matter has been debated and will proceed to voting.

CHAPTER VII
ABOUT THE SUBJECT MATTERS

ARTICLE 28.- The subject matters of the meetings will be formulated by the Secretariat and approved by the President, according to the pertinence, importance and priority of the subject matters presented to him for his consideration.

ARTICLE 29.- The subject matters of the Committee meetings will be communicated to the members together with the invitation to the meeting and with the documentation that supports the subject matters to be considered.

ARTICLE 30.- For a matter, project or requirement to be included in the subject matters of the Committee meeting they should have all the pertinent reports and be reviewed by the Secretariat.

CHAPTER VIII
ABOUT THE INFORMATION

ARTICLE 31.- The Committee can call for an informative meeting with the members of the Committee whenever it considers necessary a detailed explanation over one or several matters.

ARTICLE 32.- At the end of every ordinary, extraordinary or informative meeting the Committee shall specify the matters and/or resolutions published.

CHAPTER IX
ABOUT THE FINAL ARRANGEMENTS

ARTICLE 33.- This regulation will be approved by the members of the Committee.

ARTICLE 34.- Modifications can be made with a motion with fundaments and seconded by any of the members and approved by the absolute majority, whenever they do not agree with the functioning of the regulations or their necessity is covered by any other legal instrument or regulation.