

Shadow prices are commonly used for unskilled labor and foreign exchange resources as these resources are characterized by price distortions. Based on NEDA guidelines, a shadow price of 60% is set for unskilled labor, and 120% for foreign exchange component. The shadow price for unskilled labor reflects its economic price in an economy suffering from chronic unemployment or underemployment. The shadow price for the foreign exchange rate indicates the premium placed by the economy on scarce foreign exchange.

6.2 Project Economic Costs

The Sector Report on Cost Estimates provides a breakdown of project costs by type. Project costs consist of main construction cost, resettlement and compensation cost, administration and engineering cost, and contingencies. In estimating project economic costs, all components have been included except for price contingencies, taxes and profits. The recurrent costs comprise operations and maintenance of the flood control structures.

The cost estimates consist of the foreign currency portion and the local currency portion. Costs of construction equipment and construction materials account for the bulk of foreign costs. Labor costs and compensation costs make up most of local costs. As mentioned earlier, the foreign currency portion and unskilled labor are reckoned in terms of shadow prices.

Summarized below are the economic cost estimates which are still subject to change:

Summary of Economic Cost (P'000,000)		
	Upper Agno	Pantal-Sinocalan
Main Construction Costs	2,324	2,246
Other Costs		
Compensation	246	195
Administration	129	122
Physical Contingency	405	384
Engineering Services	372	359
Total Project Costs	3,476	3,307

Source: Cost Estimates Report, 1991.

6.3 Benefit Growth Factor and Cost-Benefit Criteria

6.3.1 Growth Factor for Benefit Flows

Flood benefits are derived from flood damage analysis but adjusted to reflect project realities. Four cost-benefit runs are made on:

- (i) Case A: Upper Agno project alone;
- (ii) Case B: Pantal-Sinocalan project alone;
- (iii) Case C: Upper Agno and Pantal-Sinocalan projects together (Simultaneous Implementation); and
- (iv) Case D: Upper Agno and Pantal-Sinocalan combination but with the former project implemented ahead of the latter project by five (5) years (Stepwise Implementation).

Based on initial findings of the JICA Agno River Study Team, the most likely project implementation scenario is Case D: Combination/ Stepwise implementation. However, the other cases are shown here to demonstrate varying conditions.

Further, the study employs two benefit flows:

- (i) Case 1: Current Development Condition (Constant Benefit Flow) This case assumes that the value of assets within the project beneficial areas remains unchanged through the project life.
- (ii) Case 2: Future Development Condition (Future Benefit Flow) This case assumes that the value of assets within the project beneficial area increases at 4.9%, the same rate as the likely GRDP growth rate.

The benefit flow of Case 2 is used in economic evaluation of the projects as it reflects the probable future development conditions within the beneficial areas. The benefit flow of Case 1 is used as supplementary information to gauge the possibility of reduced economic growth and to demonstrate viability under highly restrictive conditions.

For purposes of calculating an economic rate of return, only the direct benefits and the related costs have been included in the cost-benefit runs. The results of "what-if" cases serve to support the use of a growth factor for the benefit flow.

6.3.2 Criteria in Cost-Benefit Analysis

The criteria in the cost-benefit analysis are as follows:

(i)	Base Year	Beginning of 1990.
(ii)	Project Life	50 years (from 1995-2044)
(iii)	Economic Life	50 years (from 1995-2044)
(iv)	Construction Period	10 years (starting 1995).
(v)	Disbursement Schedule	Uniform distribution of project costs during construction period.
(vi)	Annual Operation and Maintenance Cost	0.5% of main construction cost and physical contingency of completed works.
(vii)	Price Levels	Projections of costs and benefits based on 1991 price levels. Benefits which have been computed on the basis of 1989 prices, adjusted to 1991 prices, using the following price inflators: (a) 1990 = 13.0%; (b) 1991 = 17.0%
(viii)	Timing of Benefits	In proportion to works already completed.
(ix)	Growth Factor (GF) of Benefit Flow	(a) Constant (GF = 1.0); and (b) GRDP Growth (GF = 1.049).
(x)	Social Discount Rate	15%.
(xi)	Foreign Currency Conversion Rates	US\$1.00 = ₱ 27.80 = ¥ 137.

6.4 Results of the Cost-Benefit Analysis

The results of the cost-benefit analysis are detailed in Tables 6.1 to 6.8 and summarized in the following page.

Costs and Benefits of Priority Projects		
Priority Project	Case 1 Current Development	Case 2 Future Development
Case A: Upper Agno		
Costs (Million Pesos)	3,476	3,476
Benefits (Million Pesos)	283	283
EIRR (%)	10.32	20.58
NPV (Million Pesos)	(532)	976
Case B: Pantal-Sinocalan		
Costs (Million Pesos)	3,307	3,307
Benefits (Million Pesos)	207	207
EIRR (%)	7.64	16.96
NPV (Million Pesos)	(783)	318
Case C: Combination/ Simultaneous Implementation		
Costs (Million Pesos)	6,783	6,783
Benefits (Million Pesos)	490	490
EIRR (%)	9.03	18.83
NPV (Million Pesos)	(1,315)	1,295
Case D: Combination/ Stepwise Implementation		
Costs (Million Pesos)	6,783	6,783
Benefits (Million Pesos)	490	490
EIRR (%)	9.29	20.47
NPV (Million Pesos)	(922)	1,393

Under the Current Development Condition, none of the cases shows positive NPV and EIRRs higher than 15%. The highest EIRR under this condition is at 10.32% for Case A1: Upper Agno project.

Under the Future Development Condition, Case A2 has the highest EIRR at 20.58%. Flood conditions, however, warrant implementing Upper Agno project before Pantal-Sinocalan project. Case B2 has a lower EIRR at 16.96%.

Case D2: Stepwise Implementation shows an EIRR of 20.47%, higher than the 18.83% EIRR of Case C2: Simultaneous Implementation. Cost-benefit analysis appears to validate the stepwise implementation, considering that it has the second highest EIRR but the highest NPV. Case D2 is also the most appropriate from the viewpoint of the GOP's budget considerations. It will be therefore the best choice for the GOP.

6.5 Sensitivity Analysis

Table 6.9 shows the sensitivity of Case D2, taken as the best option, to possible changes in future economic conditions. The results are summarized below:

Sensitivity Analysis	EIRR (%)
Base Case	20.47
Case 1: 10% Increase in Costs	19.07
Case 2: Reduction in Growth Factor to 3.9%	18.10

The Project is highly sensitive to an economic slowdown as it will mean a slowdown in the growth of assets within the project beneficial areas. Every 0.1% decline in the growth factor leads to a 221-basis point decrease in EIRR. The Project is less sensitive to changes in costs. Every 10% increase in costs leads to a 161 basis point reduction in EIRR.

Nonetheless, the Project remains viable under both conditions.

6.6 Project Risks

The Project faces two risks: (a) reduced economic growth and consequently reduced growth in asset values and (b) delay in project implementation and escalation in costs.

In the first instance, economic recovery in the Philippines and, consequently, in Pangasinan may remain stalled, and growth might even be slower than forecasted. The growth projections have already been modified to reflect recent events. However, the violent eruption of Mt. Pinatubo and other unforeseeable circumstances cast a shadow on the country's economic near-term scenario. A prolonged slowdown will negate the scenario of recovery and sustained growth envisioned by economic planners, thereby reducing the growth of assets expected in the project beneficial areas.

Secondly, problems arising from right-of-way land acquisition disputes can delay project implementation. Compensation for right-of-way land claims is based on tax declaration papers and the offered prices are more likely than not lower than actual market prices. This might force the GOP to institute expropriation proceedings, resulting in implementation delays and escalation of costs.

Another possible cause for delays and cost increases stems from the need to resettle and evacuate a number of the basin's residents. More often than not, affected residents would not want to be uprooted from their habitats even if another place is provided for them. The GOP will have to include livelihood opportunities in the resettlement programs for the affected population.

7. EVALUATION OF SOCIO-ECONOMIC IMPACT OF THE PROJECT

7.1 General

Economic appraisal evaluates the two flood control projects from the perspective of economic efficiency. Socio-economic impact analysis, on the other hand, assesses their social attractiveness.

The two priority projects are expected to have significant effects on socio-economic conditions not only in the project beneficial areas but also in the Impact Area as a whole. There will be negative as well as positive social impacts on human settlements, labor and employment, urbanization, living standards and poverty incidence, social services, and vital rates and population.

Spread effects are also likely, given the standing of Pangasinan as the premier province of the Ilocos Region. Moreover, the strategic location of the river basins in the heartland of Luzon gives rise to an external effect that extends beyond the confines of the province itself.

7.2 Impact on Socio-Economic Conditions

7.2.1 Social Costs

The proposed flood control works will have adverse effects on specific areas. Table 7.1 summarizes the affected population and properties. Government authorities will have to initiate public hearings to discuss the probable social and environmental impacts of the projects and thereby design programs that will mitigate the adverse effects. These social impact programs include resettlement and healthcare programs which will mean added costs to the projects.

(1) Enchroachment of Land

In the Pantal-Sinocalan project, the proposed bypass channel in Dagupan City will cut across commercial and residential areas as well as farmlands and fishponds. Likewise, construction of levees along stretches of the minor rivers will affect certain areas of Dagupan City, San Carlos City, Calasiao, Santa Barbara, Urdaneta and Malasiqui.

In the Upper Agno project, realignment of dikes and construction of new levees will encroach on certain areas of the San Manuel, Asingan, Villasis, and Rosales towns. The heightening and extension of the Carmen bridge will affect commercial areas. Meanwhile, the expansion of the Alcala-Bayambang floodway towards the Poponto swamp will cut across agricultural land.

A total of 2,005 ha is expected to be acquired for right-of way purposes, of which 1,089 ha are farmlands and 111 ha are fishponds. Some 270 ha of commercial and residential land will also be affected, spanning 3,800 houses and 22,788 residents. Once farmlands and fishponds have been transformed to other land use, it would be costly to return them to agricultural use. Encroachment of agricultural land will lead to loss of jobs and output.

(2) Inundation of Land

Under the priority plan design, the Poponto retarding basin will have a wider inundation area. This will affect an estimated 11,490 households or roughly 68,340 residents, largely from the towns of Moncada, Paniqui and Bautista. Some 18,810 ha of agricultural land and 640 ha of fishponds will be subject to intermittent flooding, resulting in negative benefits. Another 550 ha in residential/ commercial areas will be affected. As protection measures, ten ring levees will have to be erected, with Paniqui having five; Moncada, four; and Bautista, one. But only 44,580 of the affected inhabitants will be protected. A resettlement program will have to be provided for some 23,760 residents who cannot be protected.

(3) Social Conflicts Arising From Land Acquisition and Resettlement

Right-of-way land acquisition and resettlement will dislocate a number of the basin residents along the affected river stretches and inside the Poponto swamp. This will give rise to the usual social conflicts and can lead to litigation, expropriation, etc.

(4) Damage to Infrastructures

Greater inundation of Poponto swamp will affect 23.3 km of the railway and 51.4 km of roads. The railway does not pose any problem as it is presently unused. To ensure continued accessibility, however, heightening

of some 18 km of roads is necessary. Flood control design also necessitates the heightening or improvement of the Sison bridge in Rosales and several minor bridges (San Isidro, Camangahan and Morong) in the Poponto swamp area.

(5) Incidence in Malaria and Other Diseases

Inundation of Poponto swamp can lead to incidence in malaria, diarrhea, and other water-borne diseases in towns near the swamp. Moncada, Bautista, Paniqui, and Camling will again be largely affected. Healthcare in the area have to be intensified.

(6) Water Rights Conflicts

Water rights conflicts can arise as erection of new dikes can deprive some systems of access to water resources. At least two communal irrigation systems with a service area of 150 ha, located in Barangays San Vicente and Calanutian, San Manuel, are expected to be affected.

(7) Seawater Intrusion

Often seawater intrusion is a consequence of river improvements. Seawater intrusion analysis has been performed to determine the impact of the Pantal-Sinocalan project. Under the design conditions, the extent of seawater intrusion is estimated at about 16 km from the rivermouth or 1 km longer than present conditions. This additional 1 km extension is deemed to exert little social impact. Moreover, the Sinocalan irrigation dam of the existing intake facility is located about 20 km from the rivermouth which is well outside the river stretch affected by seawater.

7.2.2 Social Benefits

The social benefits are expected to outweigh these social costs.

(1) Effect on Human Settlements

With the flood control works, river basin communities will be less troubled by the onset of the typhoon season. Flood damage analysis reveals that estimates of persons affected by floods range from 61,000 to 1,589,000 depending on the flood return period. Likewise, there will be less

casualties, deaths and illnesses due to floods. Flood protection will reduce casualty, mortality and morbidity rates significantly.

Economic activity will also greatly stabilize. Although some of the human settlements and residents (numbering roughly 91,000, a population size bigger than that of Urdaneta) will suffer dislocations in the short run, the fuller development of the river basin potentials should bring about beneficial effects in the long run.

Since the priority projects will bear directly on the relatively populated and prosperous centers of the province, the positive effects will be felt throughout the Impact Area. Increased farm production and productivity, higher incomes, expanded job opportunities, improved health, etc. in the project beneficial areas will enhance socio-economic conditions of human settlements throughout the Impact Area.

(2) Effect on Labor and Employment

Flood protection will have several effects on labor and employment. The first run effect is on construction work opportunities arising from the flood control projects. During project implementation, a large number of skilled and unskilled workers will be needed. After construction, authorities need to hire additional staff to operate and maintain the facilities.

The second run effect is on work opportunities stemming from increased farm production, although this should be weighed against the loss of jobs arising from encroachment of certain farmlands and fishponds. But the third run and perhaps most significant effect is on jobs arising from changes in the economic structure and job structure.

Wage differentials between farm workers and nonfarm workers will likely lead to shifts of marginal agricultural labor to the non-agricultural labor market. In time, the lure of jobs is expected to attract migrant workers from other provinces.

(3) Effect on Urbanization

The probable immigration of workers and shifts in agricultural-nonagricultural labor force will accelerate the pace of urbanization. This is often an attendant consequence of industrialization. The emergence of Dagupan City, San Carlos City, and Urdaneta, as well as Alaminos and Sual which are both outside the beneficial areas, as urban centers of note is expected.

An unintended harmful effect will be increased pressures on social services (healthcare, education, water supply, garbage collection, police, etc.) in the urban cores which can occur if surplus workers flock to the growth centers in search of higher-paying jobs. Emergence of urban poor colonies (squatters) can be a potential consequence.

(4) Effect on Living Standards and Poverty Incidence

If the expected increases in business economic activity, improvement in economic performance and gains in incomes materialize from the fuller exploitation of river basin potentials, there will be a significant improvement in living standards and a decrease in poverty incidence. This is the expected "trickle-down" effect of the benefits expected from development projects such as the two flood control projects.

The extent and magnitude of the decline in poverty will hinge on the redistributive impact of development. Reallocation of probable direct damages between the farm sector and nonfarm sector indicates that some 65% to 70% of benefits would go to the former (see Table 7.2). While the farm sector as defined includes not only the tillers but also the owners of agricultural land, it is safe to assert that most of the benefits will likely go to farm households. Given this, the redistributive effect is seen to be favorable towards lower income groups.

(5) Effect on Social Services

Demand for social services will increase due to growing population and increasing purchasing power. As appreciating land values and higher incomes will substantially increase revenues, government capability to deliver basic services will be enhanced.

In the Philippine context, however, delivery of social services often lags behind demand. Budgetary considerations and overcentralization of delivery with the national government can also be constraining.

(6) Effect on Vital Rates and Population

As earlier said, a direct consequence is reduction of flood-related deaths and casualties, although areas near Poponto might see an increase in water-borne sicknesses.

In the long run, access to social services should improve vital rates such as life expectancy at birth, crude death rates and infant mortality rates. The general improvement in health and welfare is already evident without the projects. This should be more manifest with the projects.

Combined with the expected reversal of the outmigration patterns in Ilocos Region and Pangasinan, improved health conditions should lead to population growth in the river basin communities higher than that projected by NEDA.

7.3 Spread Effects: Impact on the Regional and Macro Economies

7.3.1 Impact on the Regional Economy

Spread effects are likely, since the flood control projects have a direct bearing on areas which are highly significant in terms of economic activity and population. And given the standing of Pangasinan as the premier province of the Ilocos Region, the likelihood of benefit diffusion beyond the basin residents is likewise strong.

If flood control succeeds in containing damages, the basin economy of Pangasinan will become more productive. With the province generating agricultural surpluses, the economic basis for processing and trading of farm produce will become stronger.

In this context, agriculture will live up to its defined development role as the lead sector to stimulate regional growth. With rural development spurring indigenous industries, Dagupan City, San Carlos City,

Urdaneta, Alaminos and Sual as agro-processing centers in the province will eventually emerge and develop linkages with the proposed RIC in San Fernando and the emerging industrial estates in Poro Point and Rosario. Spread effects of flood protection will come in terms of stronger intra-regional links for the production, processing and distribution of goods.

In short, flood protection allows Pangasinan's river basin economy to achieve its potentials and this, in turn, makes it possible for the province to set a faster growth for the Ilocos Region. The regional economy will then be able to meet, and perhaps even exceed, the projected GRDP growth.

7.2.2 Impact on the National Economy

Stronger Pangasinan-led regional growth will contribute to attainment of national development goals, as Ilocos will then be able to cast off its lagging performance. This will allow Ilocos to bridge the development gap with the more advanced regions of the country.

Increased productive capacity and purchasing power of the basin residents should spur demand for goods and services. Inter-regional commerce and trade should increase. The expanded consumer markets will redound to the benefit of the national economy.

There is one adverse external effect, i.e., the transfer of a negative outcome of the Project from one region (Region I) to another (Region III). The location of the Poponto swamp at the borders of Pangasinan and Tarlac gives rise to an unfortunate situation whereby dike protection of Pangasinan towns along Upper Agno leads to bigger floods in Tarlac towns. To mitigate the situation, programs should be put in place such as ring dike construction, resettlement, healthcare, ring dike construction, etc.

A positive external effect arises from the strategic location of the river basins. These straddle the vital North-South trunkline roads which pass through Urdaneta and Dagupan City and link points of Northern Luzon with points in the southern part of the island. Given this spatial dimension, floods particularly in the Upper Agno area lead to widespread traffic blockades and affect the land flow of goods and services throughout the Luzon heartland.

Flood damage analysis measures this as an indirect benefit in terms of reduction/ prevention of additional transport costs but such estimates (P590,000 in the Flood Damage Analysis Report, 1991) are obviously understated. In truth, the impact of flood control on traffic flows extends beyond savings on additional traffic costs since it ensures that passenger transport and commodity flows go on unhampered by floods in the area. Considering that the river basins are located in the middle of the North-South road axis, the impact of flood control is likely to be felt beyond the confines of the region and to the other points of Luzon.

TABLES

Table 1.1 (1/2) LAND AREA AND POPULATION BY GROWTH CENTER GROUPING, 1980

Growth Center Grouping City/Town	Impact Area		Beneficial Area		
	Land Area (Hectares)	Population 1980	Land Area (Hectares)	Percent to Total Area	Population Benefitted
A. DAGUPAN CITY/SAN CARLOS CITY					
Dagupan City	3,720	98,344	3,720	100.0%	98,344
San Carlos City	16,640	101,243	13,300	79.9%	80,921
Malasiqui	12,700	70,905	9,200	72.4%	51,364
Bayambang	7,520	64,037	5,700	75.8%	48,539
Mangaldan	4,480	50,434	4,480	100.0%	50,434
Calasiao	5,340	48,101	5,340	100.0%	48,101
Binalale	6,120	47,332	6,120	100.0%	47,332
San Fabian	9,240	42,018	1,100	11.9%	5,002
Santa Barbara	7,740	37,001	6,900	89.1%	32,985
San Jacinto	3,910	20,612	2,800	71.6%	14,761
Mapandan	3,000	20,094	3,000	100.0%	20,094
Bautista	12,630	18,072	600	4.8%	859
Sub-total:	93,040	618,193	62,260	66.9%	498,736
B. URDANETA					
Urdaneta	12,100	71,796	11,100	91.7%	65,862
Villasis	7,580	39,126	6,000	79.2%	30,970
Pozzorubio	13,460	38,257	3,200	23.8%	9,095
Manaoag	2,720	36,742	1,900	69.9%	25,665
Binalonan	7,760	35,574	6,100	78.6%	27,964
Sison	9,770	25,053	1,200	12.3%	3,077
Alcala	3,650	24,993	1,300	35.6%	8,902
Laoac	4,050	19,252	4,050	100.0%	19,252
Basista	1,560	17,191	1,560	100.0%	17,191
Santo Tomas	830	8,946	500	60.2%	5,389
Sub-total:	63,480	316,930	36,910	58.1%	213,369
C. TAYUG					
Tayug	5,130	26,273	1,500	29.2%	7,682
Umingan	26,460	41,364			
Asingan	6,660	37,301	6,660	100.0%	37,301
Rosales	6,840	36,582	800	11.7%	4,279
San Manuel	13,370	29,622	5,200	38.9%	11,521
San Nicolas	21,020	23,243	100	0.5%	111
San Quintin	11,590	20,835			
Santa Maria	6,930	19,018	2,800	40.3%	7,662
Belungao	9,380	17,342			
Natividad	7,680	15,246			
Sub-total:	115,080	266,826	17,060	14.8%	68,555

Table 1.1 (2/2) LAND AREA AND POPULATION BY GROWTH CENTER GROUPING, 1980

Growth Center Grouping City/Town	Impact Area		Beneficial Area		
	Land Area (Hectares)	Population 1980	Land Area (Hectares)	Percent to Total Area	Population Renfitted
D. LINGAYEN					
Lingayen	6,770	65,187	2,900	42.8%	27,924
Mangatarem	31,760	40,582			
Bugallon	16,930	39,072			
Urbiztondo	8,180	27,348	5,800	70.9%	19,391
Aguilar	15,290	22,080			
Sual	15,030	15,796			
Labrador	8,790	12,120			
Sub-total:	102,740	222,185	8,700	8.5%	47,315
E. ALAMINOS					
Alaminos	15,920	47,715			
Bolinao	23,220	39,335			
Bani	15,270	29,102			
Anda	8,200	20,454			
Agno	16,520	17,241			
Dasol	23,090	16,957			
Mabini	23,630	15,979			
Burgos	11,900	12,817			
Infanta	24,740	12,323			
Sub-total:	162,490	211,923	0	0.0%	0
F. OUTSIDE PANGASINAN					
Anao, Tarlac	2,390	6,519			
Camiling, Tarlac	14,050	53,860	100	0.7%	383
Cuyapo, Nueva Ecija	16,750	39,654			
Moncada, Tarlac	8,570	34,451			
San Manuel, Tarlac	4,210	13,491			
Rosario, La Union	7,280	29,331	1,000	13.7%	4,029
Nampicuan, Nueva Ecija	5,260	7,597			
Sub-total	58,510	184,903	1,100	1.9%	4,412
TOTAL PANGASINAN	536,830	1,636,057			
TOTAL IMPACT AREA	595,340	1,820,960			
TOTAL BENEFICIAL AREA (As defined):			126,030	23.3%	832,386

Source of Data: National Statistics Office

Table 1.2 (1/2) FEASIBILITY STUDY AND PROJET BENEFICIAL AREA
BY RIVER BASIN AND GROWTH CENTER GROUPING

(Hectares)

Growth Center Grouping City/Town	Feasibility :		Project Beneficial Area		
	Study Land Area :	Total Area	Uoper Agno	Pantal- Sinocalan	Cayanga- Patalan
A. DAGUPAN CITY/SAN CARLOS CITY					
Dagupan City	3,720	3,720		3,720	
San Carlos City	16,640	13,300		13,300	
Malasiqui	12,700	9,200	400	8,800	
Bayambang	7,520	5,700	1,700	4,000	
Mangaldan	4,480	4,480		2,980	1,500
Calasiao	5,340	5,340		5,340	
Binalale	6,120	6,120		6,120	
San Fabian	9,240	1,100			1,100
Santa Barbara	7,740	6,900		6,900	
San Jacinto	3,910	2,800			2,800
Mapandan	3,000	3,000		1,400	1,100
Bautista	12,630	600	600		
Sub-total:	93,040	82,260	2,700	53,060	6,500
B. URDANETA					
Urdaneta	12,100	11,100		10,500	600
Villasic	7,580	6,000	1,600	4,400	
Pozzorubio	13,460	3,200			3,200
Mananag	2,720	1,900			1,900
Binalonan	7,760	6,100		4,100	2,000
Sison	9,770	1,200			1,200
Alcala	3,650	1,300	1,300		
Laoac	4,050	4,050			4,050
Basista	1,560	1,560		1,560	
Santo Tomas	830	500	500		
Sub-total:	63,480	36,910	3,400	20,560	12,950
C. TAYUG					
Tayug	5,130	1,500	1,500		
Umingan	26,460				
Asingan	6,660	6,660	3,000	3,660	
Rosales	6,840	800	800		
San Manuel	13,370	5,200	3,600	1,600	
San Nicolas	21,020	100	100		
San Quintin	11,590				
Santa Maria	6,950	2,800	2,800		
Balungao	9,380				
Natividad	7,680				
Sub-total:	115,080	17,060	11,800	5,260	0

Table 1.2 (2/2) FEASIBILITY STUDY AND PROJCT BENEFICIAL AREA
BY RIVER BASIN AND GROWTH CENTER GROUPING
(Hectares)

Growth Center Grouping City/Town	Feasibility : Study Land : Area :	Project Beneficial Area			
		Total Area	Upper Agno	Pantal- Sinocalan	Cayanga- Patalan
D. LINGAYEN					
Lingayen	6,770	2,900		2,900	
Mangatarem	31,760				
Bugallon	16,930				
Urbiztonde	8,180	5,800		5,800	
Aguilar	15,290				
Sual	15,030				
Labrador	8,780				
Sub-total:	102,740	8,700	0	8,700	0
E. ALAMINDS					
Alaminos	15,920				
Bolinao	23,220				
Bani	15,270				
Anda	8,200				
Agno	16,520				
Dasol	23,090				
Mabini	23,630				
Burgos	11,900				
Infanta	24,740				
Sub-total:	162,490	0	0	0	0
F. OUTSIDE PANGASINAN					
Anao, Tarlac	2,390				
Camiling, Tarlac	14,050	100	100		
Cuyapo, Nueva Ecija	16,750				
Moncada, Tarlac	8,570				
San Manuel, Tarlac	4,210				
Rosario, La Union	7,280	1,000			1,000
Nampicuan, Nueva Ecija	5,260				
Sub-total	58,510	1,100	100	0	1,000
TOTAL PANGASINAN	536,830				
TOTAL IMPACT AREA	595,340				
TOTAL BENEFICIAL AREA (As defined):		126,030	18,000	87,580	20,450

Source of Data: National Statistics Office; Flood Damage Analysis Report, 1991

Table 3.1 GROSS DOMESTIC PRODUCT, BY INDUSTRIAL ORIGIN AT CONSTANT 1972 PRICES,
1986-1990 (In Thousand Pesos)

Region	1986	1987	1988	1989	Advance Estimates 1990
Philippines	91,165,600	95,372,760	101,449,730	107,144,249	109,890,000
NCR	26,619,055	28,424,717	31,058,274	33,256,409	34,489,000
Ilocos	4,253,974	3,182,666	3,327,278	3,387,896	3,348,500
CAR	0	1,466,043	1,547,451	1,664,697	1,581,000
Cagayan Valley	2,291,183	1,948,413	2,047,626	2,104,369	2,063,500
Central Luzon	7,378,268	7,668,896	8,163,608	8,791,424	9,091,000
Southern Tagalog	13,610,324	13,170,897	13,773,667	14,383,703	14,780,500
Bicol	3,057,901	3,146,819	3,332,379	3,436,705	3,515,000
Western Visayas	6,345,618	6,607,940	6,913,268	7,153,836	7,368,500
Central Visayas	6,476,978	6,988,714	7,514,039	8,085,819	8,411,000
Eastern Visayas	2,297,152	2,957,899	3,068,923	3,120,977	3,210,000
Western Mindanao	3,367,939	3,630,660	3,783,677	3,976,784	4,113,000
Northern Mindanao	5,004,118	5,266,857	5,620,172	5,936,841	6,182,500
Southern Mindanao	6,678,072	7,120,613	7,329,758	7,654,704	7,837,000
Central Mindanao	3,775,018	3,791,626	3,969,510	4,190,085	4,307,000

Note : Regional levels derived as average of range estimates. Figures may not add up to total due to rounding error.

Source: Economic And Social Statistic Office, National Statistic Office (NSCB) for 1986 to 1989 levels.
Regional Development Coordinator Staff, National Economic and Development Authority (NEDA)
for regional advance estimates.

Table 3.2 REAL PER CAPITA GROSS DOMESTIC PRODUCT
PHILIPPINES, BY REGION, 1988-1990

(In 1972 Constant Prices)

Region	Real Per Capita GDP (Pesos)		
	1988	1989	1990 †
Philippines	1,756	1,812	1,817
NCR	4,191	4,365	4,404
Ilocos	974	973	944
CAR	1,409	1,482	1,376
Cagayan Valley	910	917	881
Central Luzon	1,385	1,456	1,468
Southern Tagalog	1,769	1,793	1,789
Bicol	873	889	899
Western Visayas	1,329	1,353	1,370
Central Visayas	1,699	1,794	1,831
Eastern Visayas	1,025	1,033	1,053
Western Mindanao	1,257	1,292	1,309
Northern Mindanao	1,682	1,735	1,765
Southern Mindanao	1,743	1,749	1,760
Central Mindanao	1,355	1,386	1,380

Notes: † Advance Estimates from Regional Development Coordinating Staff, National Economic and Development Authority.

Source of Data: National Statistical Coordination Board, National Economic and Development Authority

Table 3.3 INVESTMENT FLOWS BY REGION, 1986-1990

(In Thousand Pesos)

Region	1986	1987	1988	1989	1990
Philippines	2,191,961	9,844,141	28,720,161	62,303,895	99,895,449
NCR	1,121,321	4,519,640	13,122,913	20,676,587	24,454,625
CAR	0	0	0	655,346	6,780,000
Ilocos	0	21,598	86,276	1,143,198	9,293,321
Cagayan Valley	0	0	0	39,273	127,661
Central Luzon	99,732	1,376,808	6,580,109	4,972,642	5,959,213
Southern Tagalog	429,399	2,740,778	4,577,464	24,837,674	39,035,816
Bicol	5,500	164,095	77,992	168,489	67,026
Western Visayas	285,115	358,006	640,560	1,333,437	571,086
Central Visayas	106,450	162,270	1,171,313	3,212,079	4,063,117
Eastern Visayas	0	0	31,858	1,092,533	33,705
Western Mindanao	17,562	184,552	362,195	184,579	235,764
Northern Mindanao	63,491	48,846	1,283,287	795,073	2,995,834
Southern Mindanao	26,609	112,938	745,251	581,998	722,950
Central Mindanao	36,000	29,528	0	743,681	171,005
No Site Yet	842	102,082	40,933	1,867,106	5,384,326

Source of Data: Planning and Research Division, Board of Investments

Table 3.4 INFRASTRUCTURE SPENDING PROGRAM, 1986-1990
(In Thousand Pesos)

Region	1986	1987	1988	1989	1990
Philippines	6,448,173	8,051,216	8,596,470	12,720,288	16,734,551
NCR	1,054,267	1,094,285	1,001,873	1,869,496	2,295,843
Ilocos	525,924	700,846	387,303	583,149	658,379
CAR	-	-	282,392	393,924	539,694
Cagayan Valley	290,245	448,672	368,505	521,042	713,145
Central Luzon	466,924	486,050	530,140	740,470	1,067,172
Southern Tagalog	852,540	1,086,531	1,002,554	1,367,714	2,033,923
Bicol	486,246	568,501	648,198	924,256	1,129,371
Western Visayas	450,866	479,842	613,393	915,589	1,217,235
Central Visayas	257,523	379,458	535,827	820,297	954,563
Eastern Visayas	557,646	652,380	662,843	732,134	983,799
Western Mindanao	314,152	473,217	459,400	582,429	1,101,344
Northern Mindanao	309,191	439,890	540,603	821,878	921,385
Southern Mindanao	429,028	527,854	606,632	815,452	994,137
Central Mindanao	291,405	446,330	567,395	682,344	950,563
Nationwide/inter-Regional	162,216	267,360	389,412	950,215	1,173,991

Table 3.5 (1/2) SHARE OF INFRASTRUCTURE SPENDING TO GRDP AT CONSTANT 1972 PRICES, 1986 - 1990

		(In Thousand Pesos)				
Region		1986	1987	1988	1989	1990
First Tier						
NCR	GRDP	26,619,055	28,424,717	31,058,474	33,256,409	34,489,000
	Infra Spending	125,538	122,116	1,011,312	175,046	179,855
	Share	0.47%	0.43%	3.26%	0.53%	0.52%
Second Tier						
Southern Tagalog	GRDP	13,610,324	13,170,897	13,773,667	14,383,703	14,780,500
	Infra Spending	101,517	121,251	101,381	128,063	159,336
	Share	0.75%	0.92%	0.74%	0.89%	1.08%
Central Luzon	GRDP	7,378,268	7,668,896	8,163,608	8,791,424	9,091,000
	Infra Spending	55,599	54,241	53,609	69,332	83,601
	Share	0.75%	0.71%	0.66%	0.79%	0.92%
Central Visayas	GRDP	6,476,978	6,988,714	7,514,039	8,085,819	8,411,000
	Infra Spending	30,665	42,345	54,184	76,807	74,780
	Share	0.47%	0.61%	0.72%	0.95%	0.89%
Western Visayas	GRDP	6,345,818	6,607,940	6,913,268	7,153,836	7,368,500
	Infra Spending	53,687	53,548	62,028	85,729	95,357
	Share	0.85%	0.81%	0.90%	1.20%	1.29%
Third Tier						
Northern Mindanao	GRDP	5,004,118	5,266,857	5,620,172	5,936,841	6,182,500
	Infra Spending	36,817	49,089	54,667	76,955	72,181
	Share	0.74%	0.93%	0.97%	1.30%	1.17%
Central Mindanao	GRDP	3,775,018	3,791,626	3,969,510	4,190,085	4,307,000
	Infra Spending	34,699	49,088	57,376	63,890	74,466
	Share	0.92%	1.31%	1.45%	1.52%	1.73%
Western Mindanao	GRDP	3,367,939	3,630,660	3,788,677	3,976,784	4,113,000
	Infra Spending	37,408	52,809	46,457	54,535	86,278
	Share	1.11%	1.45%	1.23%	1.37%	2.10%

Source: National Statistical Coordination Board for GRDP levels; Department of Public Works and Highways for programmed infrastructure spending, deflated to 1972 prices using the prices index for government construction.

Table 3.5 (2/2) SHARE OF INFRASTRUCTURE SPENDING TO GRDP
AT CONSTANT 1972 PRICES, 1986-1990

(In Thousand Pesos)

Fourth Tier Bicol	GRDP	3,057,901	3,146,819	3,332,379	3,463,705	3,515,000
	Infra Spending	57,900	63,442	65,547	86,541	88,474
	Share	1.89%	2.02%	1.97%	2.50%	2.52%
Ilocos	GRDP	4,253,974	3,182,666	3,327,278	3,387,896	3,348,000
	Infra Spending	62,625	78,211	39,165	54,602	51,577
	Share	1.47%	2.47%	1.18%	1.61%	1.54%
Eastern Visayas	GRDP	2,297,152	2,957,899	3,068,923	3,120,977	3,210,000
	Infra Spending	66,402	72,802	67,028	68,552	77,070
	Share	2.89%	2.46%	2.18%	2.20%	2.40%
Cagayan Valley	GRDP	2,291,183	1,948,413	2,047,626	2,104,369	2,063,500
	Infra Spending	34,561	50,069	37,264	48,787	55,867
	Share	1.51%	2.57%	1.82%	2.32%	2.71%
CAR	GRDP	-	1,466,048	1,547,451	1,664,697	1,581,000
	Infra Spending	-	-	28,556	36,884	42,279
	Share	-	-	1.85%	2.22%	2.67%
Total Philippines	GRDP	91,165,600	95,372,760	449,730	107,144,209	109,890,000
	Infra Spending	767,822	89,847	869,296	1,191,038	1,310,971
	Share	0.84%	0.94%	0.86%	1.11%	1.19%

Source: National Statistical Coordination Board for GRDP levels;
Department of Public Works and Highways for programmed
infrastructure spending, deflated to 1972 prices using the
price index for government construction.

Table 3.6 EXPORTS BY REGION, 1986-1989 (In US Dollars)

Region	1986	1987	1988	1989
Philippines	4,841,780,491	5,720,238,358	7,074,189,567	7,820,712,7
NCR	2,702,713,669	3,281,123,126	4,038,493,871	4,626,101,8
Ilocos	177,967,014	247,264,266	260,833,164	244,614,4
Cagayan Valley	7,962,689	7,452,670	6,955,494	6,159,0
Central Luzon	181,388,971	234,326,604	323,222,405	300,898,4
Southern Tagalog	169,814,433	190,347,902	258,710,309	258,436,9
Bicol	45,864,666	72,182,794	31,180,112	24,693,0
Western Visayas	34,878,922	24,553,147	19,013,702	132,784,1
Central Visayas	337,070,026	394,256,390	546,036,121	587,481,7
Eastern Visayas	313,737,186	291,333,728	414,721,458	469,586,4
Western Mindanao	78,169,875	71,049,228	129,046,974	157,425,8
Northern Mindanao	336,325,776	308,662,569	358,050,508	351,690,2
Southern Mindanao	371,983,569	457,699,990	508,232,272	517,673,7
Central Mindanao	83,903,695	139,985,944	178,693,177	43,166,6

Source: Trade Division, National Statistic Office

Table 3.7 IMPORTS BY REGION, 1986-1989

(In US Dollars)

Region	1986	1987	1988	1989
Philippines	5,043,597,455	6,736,968,619	8,159,377,555	10,418,820,759
NCR	3,271,955,980	4,410,131,436	5,697,496,518	7,537,514,998
Ilocos	131,155,704	198,430,216	189,331,736	206,964,049
Cagayan Valley	194,834	5,321	45,763	0
Central Luzon	437,740,361	620,497,640	513,630,112	612,240,288
Southern Tagalog	564,421,381	804,286,935	860,964,579	973,572,524
Bicol	4,793,118	2,820,378	4,898,633	12,893,261
Western Visayas	20,372,303	13,411,233	33,831,132	34,885,002
Central Visayas	154,652,809	202,252,322	255,679,442	270,210,287
Eastern Visayas	98,673,609	87,645,435	155,757,943	200,685,652
Western Mindanao	11,279,972	4,353,074	6,164,866	7,469,290
Northern Mindanao	124,534,177	128,309,333	118,866,603	141,130,424
Southern Mindanao	83,028,453	107,107,791	102,207,733	110,095,396
Central Mindanao	140,794,754	157,718,505	220,502,496	311,459,688

Source: Trade Division, National Statistics Office

Table 3.8 POPULATION AND HOUSEHOLD STATISTICS BY REGION,
1980 AND 1990

Region	1990				:	1980			
	Population (Thousands)	Population Density (per sq.km.)	Households (Thousands)	Average Household Size		Population (Thousands)	Population Density (per sq.km.)	Households (Thousands)	Average Household Size
Philippines	60,477	202	11,300	5.3	48,098	160	8,607	5.6	
NCR	7,832	12,314	1,959	5.0	5,926	9,318	1,104	5.4	
CAR	1,149	63	219	5.3	914	50	175	5.4	
Ilocos	3,548	276	659	5.4	2,923	228	533	5.5	
Cagayan	2,342	87	446	5.3	1,919	72	347	5.5	
Central Luzon	6,191	340	1,162	5.3	4,903	263	838	5.7	
Southern Tagalog	8,261	176	1,582	5.2	6,119	130	1,107	5.5	
Bicol	3,911	222	705	5.6	3,477	197	504	5.7	
Western Visayas	5,379	266	991	5.5	4,526	224	787	5.8	
Central Visayas	4,593	307	874	5.3	3,787	253	698	5.4	
Eastern Visayas	3,048	142	584	5.2	2,800	131	511	5.5	
Western Mindanao	3,145	168	575	5.5	2,529	135	439	5.8	
Northern Mindanao	3,503	124	636	5.5	2,759	97	490	5.7	
Southern Mindanao	4,453	141	822	5.4	3,347	106	592	5.7	
Central Mindanao	3,121	134	575	5.4	2,271	97	393	5.8	

Source of data: Census of Population and Housing, National Statistics Office
National Statistical Coordination Board, National Economic and Development Authority

Table 3.9 NET INTERNAL MIGRATION RATE BY REGION, 1981-1988

Region	1981	1982	1983	1984	1985	1986	1987	1988
NCR	7.4	7.1	6.9	6.6	6.3	6.1	5.9	5.7
Ilocos	(3.3)	(3.3)	(3.2)	(3.2)	(3.2)	(3.1)	(3.1)	(3.1)
Cagayan	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.1)
Central Luzon	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Southern Tagalog	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3
Bicol	(4.2)	(4.2)	(4.1)	(4.1)	(4.1)	(4.0)	(4.0)	(3.9)
Western Visayas	(3.8)	(3.7)	(3.7)	(3.6)	(3.6)	(3.5)	(3.5)	(3.4)
Central Visayas	(3.5)	(3.4)	(3.4)	(3.3)	(3.3)	(3.2)	(3.2)	(3.1)
Eastern Visayas	(5.9)	(5.9)	(5.8)	(5.8)	(5.7)	(5.7)	(5.6)	(5.5)
Western Mindanao	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)
Northern Mindanao	2.8	2.7	2.7	2.7	2.7	2.7	2.6	2.6
Southern Mindanao	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Central Mindanao	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7

Source of data: Population Studies Division, National Statistics Office

Table 3.10 LABOR AND EMPLOYMENT BY REGION, JANUARY 1990

(In Thousands)

Region	Labor Force	% to Total	Employed	% to Total	Unemployed	% to Total	Unemployment Rate
Philippines	23,971	100.0%	21,905	100.0%	2,066	100.0%	8.6%
NCR	3,069	12.8%	2,568	11.7%	501	24.2%	16.3%
CAR	486	2.0%	463	2.1%	23	1.1%	4.7%
Ilocos	1,333	5.6%	1,212	5.5%	121	5.9%	9.1%
Cagayan	998	4.2%	954	4.4%	44	2.1%	4.4%
Central Luzon	2,339	9.8%	2,086	9.5%	253	12.2%	10.8%
Southern Tagalog	3,082	12.9%	2,823	12.9%	259	12.5%	8.4%
Bicol	1,787	7.5%	1,681	7.7%	106	5.1%	5.9%
Western Visayas	2,161	9.0%	1,996	9.1%	165	8.0%	7.6%
Central Visayas	1,819	7.6%	1,697	7.7%	122	5.9%	6.7%
Eastern Visayas	1,406	5.9%	1,304	6.0%	102	4.9%	7.3%
Western Mindanao	1,144	4.8%	1,068	4.9%	76	3.7%	6.6%
Northern Mindanao	1,472	6.1%	1,378	6.3%	94	4.5%	6.4%
Southern Mindanao	1,734	7.2%	1,586	7.2%	148	7.2%	8.5%
Central Mindanao	1,141	4.8%	1,089	5.0%	52	2.5%	4.6%

Source: Bureau of Labor and Employment Statistics, Department of Labor and Employment

Table 3.11 SELECTED FAMILY INCOME STATISTICS BY REGION,
1985 AND 1988

Region	Income Distribution (In Percent)		Average Family Income		Average Family Income		Average Family Income	
	1985	1988	(In Pesos)	1985	(In Pesos)	1985	1988	Index (Philippines=100)
Philippines	100.0	100.0	31,052.0	39,728.0	8,807.0	9,907.0	100.0	100.0
NCR	24.5	26.0	57,193.0	77,093.0	16,253.0	17,710.0	184.5	178.8
CAR	2.2	1.7	34,558.0	33,357.0	9,746.0	8,520.0	110.7	86.0
Ilocos	5.7	4.9	29,958.0	33,421.0	8,448.0	8,834.0	95.9	89.2
Cagayan	3.6	3.4	27,433.0	32,765.0	8,501.0	8,609.0	96.5	86.9
Central Luzon	12.1	11.3	38,819.0	46,034.0	10,413.0	11,106.0	118.2	112.1
Southern Tagalog	12.8	12.9	29,985.0	38,381.0	9,015.0	10,088.0	102.4	101.6
Ricci	4.4	4.6	20,221.0	26,676.0	5,766.0	6,671.0	66.3	67.3
Western Visayas	7.2	6.9	24,807.0	30,397.0	6,613.0	7,489.0	75.1	75.5
Central Visayas	5.3	5.4	20,756.0	37,351.0	5,673.0	6,836.0	64.4	69.0
Eastern Visayas	3.3	3.5	17,767.0	25,649.0	5,267.0	6,623.0	59.8	66.9
Western Mindanao	3.8	4.1	23,779.0	32,033.0	7,025.0	8,762.0	79.8	88.4
Northern Mindanao	5.1	4.9	27,402.0	34,422.0	7,691.0	8,804.0	86.3	88.9
Southern Mindanao	6.5	6.4	28,222.0	36,680.0	8,015.0	9,188.0	91.0	91.9
Central Mindanao	3.5	4.0	24,366.0	34,605.0	6,901.0	8,783.0	78.4	88.7

Source of data: Family Income and Expenditures Survey, 1985 and 1988 (Preliminary), National Statistics Office

Table 3.12 POVERTY AND SUBSISTENCE INDICATORS BY REGION,
1985 AND 1988

(In Current Prices)

Region	Total Poverty Threshold (Pesos)		Incidence of Poverty (Percent)		Subsistence Level † (Pesos)	Magnitude (Number of Families)	Subsistence Incidence (Percent)
	1985	1988	1985	1988	1985	1985	1985
Philippines	2,381	2,709	58.9%	49.5%	1,261.8	2,406,470	24.4%
NCR	3,232	4,037	43.9%	31.8%	1,441.0	78,149	6.0%
Outside NCR					1,258.8	2,328,251	27.3%
Ilocos Region	2,389	2,597	51.6%	47.5%	1,299.4	109,229	15.4%
Cagayan Valley	2,201	2,376	55.7%	48.9%	1,236.1	87,523	18.9%
Central Luzon	2,552	2,881	43.5%	39.6%	1,357.4	111,676	11.7%
Southern Tagalog	2,471	2,832	55.2%	49.3%	1,280.4	264,872	20.3%
Bicol Region	2,143	2,443	73.5%	65.3%	1,195.7	250,147	37.4%
Western Visayas	2,453	2,654	73.4%	61.8%	1,263.3	294,581	33.4%
Central Visayas	1,987	2,173	69.9%	54.6%	1,192.1	310,951	39.7%
Eastern Visayas	2,015	2,263	70.2%	60.5%	1,245.4	240,900	42.4%
Western Mindanao	2,119	2,289	63.0%	52.0%	1,269.7	171,205	34.6%
Northern Mindanao	2,249	2,439	65.6%	51.5%	1,254.1	191,152	33.8%
Southern Mindanao	2,399	2,763	60.2%	52.2%	1,292.0	166,786	23.6%
Central Mindanao	2,212	2,468	63.6%	47.1%	1,303.6	129,499	29.7%

Notes: † Data for 1988 not available.

Source of data: Economic and Social Indicators, National Statistical Coordination Board

Table 3.13 SELECTED HEALTH INDICATORS BY REGION, 1985-1988

Region	Crude Death Rate (Per 1,000 Population)				Average Life Expectancy at Birth (In Years)				Infant Mortality Rate (Per 1,000 Livebirths)			
	1985	1986	1987	1988	1985	1986	1987	1988	1985	1986	1987	1988
Philippines	7.9	7.2	7.6	7.5	63.1	63.4	63.7	64.0	56.6	55.3	54.2	52.9
NCR	5.4	5.6	5.3	5.2	67.2	67.4	67.7	67.9	39.1	38.0	37.2	36.2
Ilocos	8.8	8.6	8.4	8.2	54.5	54.8	55.1	55.4	50.7	49.4	48.2	46.9
Cagayan	9.5	9.4	9.2	9.0	59.8	60.1	60.4	60.7	71.3	69.9	68.5	67.2
Central Luzon	6.5	6.3	6.2	6.1	66.5	66.8	67.1	67.4	42.1	40.9	39.6	38.6
Southern Tagalog	6.8	6.7	6.6	6.5	65.7	65.9	66.2	66.5	45.7	44.4	43.2	42.3
Bicol	8.3	8.2	8.1	7.9	52.6	52.9	53.2	53.5	58.6	57.3	56.3	55.0
Western Visayas	8.3	8.1	8.0	7.8	55.9	56.1	56.3	56.6	54.4	53.4	52.3	50.8
Central Visayas	7.9	7.8	7.6	7.5	67.3	67.6	67.9	68.2	46.9	45.7	44.4	43.1
Eastern Visayas	10.0	9.9	9.7	9.6	61.5	61.8	62.1	62.4	71.3	69.9	68.5	67.1
Western Mindanao	13.0	12.8	12.6	12.4	54.5	54.8	55.1	55.4	105.0	103.4	101.9	100.6
Northern Mindanao	11.1	10.9	10.7	10.5	57.5	58.4	58.7	59.0	84.8	82.8	81.1	79.2
Southern Mindanao	11.6	11.4	11.3	11.1	57.2	57.5	58.1	58.4	89.9	88.5	87.0	85.5
Central Mindanao	13.1	12.9	12.7	12.5	54.2	54.9	55.1	55.4	105.0	103.4	101.9	100.6

Source of Data: Population Studies Division, National Statistics Office

Table 3.14 SELECTED RESOURCE INDICATORS, Region I and Pangasinan

Sector	Unit of Measure	Reference Date	Pangasinan	Region I	% Share
Land Resource			5,368	12,840	41.8%
Land Area	Sq Km				
Land Classification	Sq Km	1989			
Alienable and Disposable			4,064	7,380	55.1%
Forestland			1,304	3,109	41.9%
Unclassified			0	2,351	-
Land Use	Sq Km	1983			
Agriculture			2,581	3,864	66.8%
Forestry			765	3,333	23.0%
Pastureland			1,308	4,218	31.0%
Settlements			318	568	56.0%
Mineral			116	256	45.3%
Inland Forest			218	299	72.9%
Open Land			63	302	20.9%
Mineral Resource					
Metallic	Metric Ton	1981			
Chromite			134,210	978,386	13.7%
Cooper			22,185,930	7,795,930	28.0%
Non-metallic	Metric Ton	1981			
Silica			4,860,000	4,860,000	100.0%
Asbestos			1,466,625	1,466,625	100.0%
Kaolinitic Clay			580	580	100.0%
Limestone			408,463,480	408,463,480	0.3%
Guano			43,583	43,583	95.4%
Infrastructure					
Road Network	Km	1988	4,170,700	11,984,600	34.8%
Airport	Number	1988			
International			0	1	
Secondary			0	1	
Feeder			2	3	66.7%
Sea Port					
Sub-Port			3	6	50.0%
Power		1988	69/230 KV		
Communication Facilities	Number	1988			
Post Office			142	372	
Telegraph Offices			49	138	35.5%
Radio Stations			67	153	43.8%
Telephone Stations			12	30	40.0%
Telephone Stations			14	51	27.5%

Source: Medium - Term Ilocos Region Development Plan, 1987-1982; Trade and Investment Plan for Pangasinan, 1988 (Department of Trade and Industry); Highlights of Ilocos Situationer, 1988 (NEDA); Bureau of Agricultural Statistics.

Table 3.15 SELECTED PRODUCTION INDICATORS, Region I and Pangasinan

Sector	Unit of Measure	Reference Date	Pangasinan	Region I	% Share
Agricultural Crops	Metric Ton	1988	1,012,215	1,825,599	55.4%
Rice			737,632	1,259,637	58.6%
Corn			30,580	44,855	68.2%
Rootcrops			7,951	39,460	20.2%
Legumes			12,309	25,982	47.4%
Vegetable			130,589	254,196	51.4%
Fruits			71,114	102,783	69.2%
Tobacco			10,194	33,498	30.4%
Cotton			1,031	1,515	68.0%
Sugarcane			4,885	10,480	46.6%
Cacao/Coffee			5	949	0.5%
Ipil-ipil			5,925	102,244	5.8%
Meat Production	Metric Ton	1988	16,904	49,896	33.9%
Carabaef			4,438	6,395	69.4%
Beef			2,461	6,649	37.0%
Chevon			332	1,090	30.5%
Pork			7,317	31,500	23.2%
Poultry			1,763	3,087	57.1%
Eggs			593	1,174	50.5%
Fisheries Production	Metric Ton	1988	45,069	50,350	89.5%
Aquaculture			19,093	19,440	98.2%
Municipal			24,728	27,441	90.1%
Commercial			1,248	3,469	36.0%
Forestry Production		1988			
Fuelwood	Cubic Meter		825	1,778	46.4%
Charcoal	Sacks		37,046	37,046	100.0%
Mineral Production		1989			
Production Value	Million Pesos		211	298	70.8%
Salt	Metric Ton		5,810	5,810	100.0%
Limestone	Metric Ton		688,993	1,150,187	60.0%
Sand and Gravel	Cubic Meter		181,681	664,653	27.3%
Shale Clay	Metric Ton		100,110	127,067	78.8%

Source: Medium - Term Ilocos Region Development Plan, 1987-1982 (NEDA); Trade and Investment Plan for Pangasinan, 1988 (Department of Trade and Industry); Highlights of Ilocos Situationer, 1988(NEDA); Bureau of Agricultural Statistics.

Table 3.16 SELECTED SOCIAL INDICATORS, Region I and Pangasinan

Sector	Unit of Measure	Reference Date	Pangasinan	Region I	% Share
Demographic Indicators					
Population	Thousand	1990	2,018	3,548	56.9%
Population growth	Percent	1980 - 1990	2.1%	1.9%	0.2%
Population Density (Per Sq Km)	Number	1990	375	276	
Number of Household	Thousand	1990	367	659	55.7%
Average	Number	1990	5.5	5.6	
Labor and Employment					
Potential Labor Force	Thousand	1988	1,150	2,090	55.0%
Labor Force Participation Rate (LFPR)	Percent	1988	60.0%	62.4%	
Labor Force	Thousand	1988	699	1,306	53.5%
Employment Rate	Percent	1988	95.6%	96.3%	
Unemployment Rate	Percent	1988	4.4%	3.7%	
Income and Wealth Indicators					
Average Family Income	Pesos	1985	29,243	29,958	
Proportion of Families Deriving Income from Primary Source	Percent	1985	70.8%	70.3%	
Urban-Rural Index of Income disparity	Index	1985	149.70	-	
Average Family Disbursements	Pesos	1985	26,128	27,832	
Proportion of Food Expenditures	Percent	1985	55.2%	54.3%	
Health and Mortality Indicators					
Crude Birth Rate (Per 1,000 Population)	Percent	1988	12.1%	11.6%	
Crude Death Rate (Per 1,000 Population)	Percent	1988	2.7%	2.9%	
Infant Mortality Rate (Per 1,000 livebirth)	Percent	1988	36.9%	35.7%	
Maternal Mortality Rate (Per 1,000 livebirth)	Percent	1988	0.9%	0.6%	

Source: Medium - Term Ilocos Region Development Plan, 1987-1982 (NEDA); Trade and Investments Plan for Pangasinan, 1989 (Department of Trade and Industry); Highlights of Ilocos Situationer, 1988 (NEDA); Bureau of Agricultural Statistics; National Statistics Office.

Table 3.17 (1/2) AGRICULTURAL LAND USE BY GROWTH CENTER GROUPING

(In Hectares)

Growth Center Grouping City/Town	Rice Paddy			Other Agricultural: Land	Fishpond	Total
	Irrigated	Rainfed	Total			
A. DAGUPAN CITY/SAN CARLOS CITY						
Dagupan City	0	305	305	76	1,342	1,723
San Carlos City	4	6,035	6,039	585	162	6,786
Malasiqui	288	3,851	4,139	207	1,096	5,442
Bayambang	233	4,650	4,883	2,047	70	7,000
Mangaldan	358	1,907	2,265	1,051	284	3,600
Calasiac	598	2,616	3,214	125	28	3,367
Binmaley	0	800	800	127	2,575	3,502
San Fabian	419	211	630	94	0	724
Santa Barbara	553	3,563	4,116	457	0	4,573
San Jacinto	662	883	1,545	235	0	1,780
Mapandan	150	759	909	403	26	1,338
Bautista	210	2,460	2,670	3,225	469	6,364
Sub-total:	3,475	28,040	31,515	8,632	6,052	46,199
B. URDANETA						
Urdaneta	5,249	1,521	6,770	2,135	0	8,905
Villasis	1,130	3,073	4,203	1,540	0	5,743
Pozzerubio	432	348	780	191	0	971
Manaoag	671	1,092	1,763	39	137	1,939
Binalonan	920	1,751	2,671	596	2	3,269
Sison	195	151	346	98	0	444
Alcala	1,040	2,560	3,600	0	0	3,600
Laoac	181	109	290	35	501	826
Rasista	0	1,176	1,176	152	11	1,339
Santo Tomas	601	167	768	29	0	797
Sub-total:	10,419	11,948	22,367	6,815	651	27,833
C. TAYUG						
Tayug	2,528	810	3,338	452	13	3,803
Umingan	480	732	1,412	124	0	1,536
Asingan	4,038	150	4,188	556	7	4,751
Rosales	2,680	848	3,528	223	0	3,751
San Manuel	2,048	28	2,076	411	0	2,487
San Nicolas	310	0	310	40	0	350
San Quintin	231	679	910	88	0	998
Santa Maria	1,485	2,401	3,886	2,715	0	6,601
Balungao	945	837	1,782	259	6	2,047
Natividad	368	62	430	88	0	518
Sub-total:	15,113	6,747	21,860	4,956	26	26,842

Table 3.17 (2/2) AGRICULTURAL LAND USE BY GROWTH CENTER GROUPING

(In Hectares)

Growth Center Grouping City/Town	Rice Paddy		Total	Other Agricultural:		Total
	Irrigated	Rainfed		Land	Fishpond	
D. LINGAYEN						
Lingayen	0	1,068	1,068	364	1,544	2,976
Mangatarem	2,354	2,087	4,441	509	1	4,951
Bugallon	222	458	680	228	107	1,015
Urbiztonde	0	3,036	3,036	1,244	20	4,320
Aguilar	324	121	445	0	2	447
Sual	2,165	2,324	4,489	1,961	117	6,567
Labrador	8	8	16	11	105	132
Sub-total:	5,073	9,102	14,175	4,337	1,896	20,408
E. ALAMINOS						
Alaminos	2,108	2,000	4,108	4,686	1,226	10,020
Bolinao	1	410	411	1	9	421
Bani	132	6,175	6,307	4,139	2,585	13,031
Anda	54	2,061	2,115	883	604	3,602
Agno	144	4,938	5,082	3,552	378	9,012
Dasol	204	3,121	3,325	992	480	4,797
Mabini	135	4,064	4,199	7,512	215	11,926
Burgos	98	3,702	3,800	572	0	4,372
Infanta	619	116	935	273	127	1,335
Sub-total:	3,695	26,587	30,282	22,610	5,624	58,516
F. OUTSIDE PANGASINAN						
Anao, Tarlac	120	1,374	1,494	750	0	2,244
Camiling, Tarlac	3,026	932	3,958	1,011	0	4,969
Cuyapo, Nueva Ecija	1,025	2,803	3,828	112	0	3,940
Moncada, Tarlac	300	2,618	2,918	2,116	64	5,098
San Manuel, Tarlac	1,427	543	1,970	832	22	2,824
Rosario, La Union	500	0	500	168	0	668
Naopicuan, Nueva Ecija	114	3,000	3,114	63	10	3,187
Sub-total	6,512	11,270	17,782	5,052	96	22,930
TOTAL AREA	44,287	93,694	137,981	50,402	14,345	202,728

Source of Data: City and Municipal Profiles, 1989, Department of Agriculture (Region I Office).

Table 4.1 SELECTED ECONOMIC INDICATORS 1985-1990

	1985	1986	1987	1988	1989	1990
GROWTH AND PRICES						
Gross National Product (Real Growth. %)	-4.1	1.9	5.9	6.7	5.6	3.1
Gross Domestic Product (Real Growth. %)	-4.3	1.5	4.7	6.4	6.0	2.5
Inflation (%)	23.1	0.8	3.8	8.8	10.6	14.2
Per Capita GNP (US\$)	588	530	575	665	725	731
EXTERNAL TRADE						
Balance of Trade (US\$ Million)	-486	-202	-1,017	-1,085	-2,598	-3,943
Current Account (US\$ Million)	-77	996	-444	-390	-1,465	-2,645
Balance of Payment (US\$ Million)	2,389	1,242	264	650	451	-183
P/US\$ Exchange Rate End-of-Period	19.03	20.53	20.80	21.34	22.45	28.00
Average for Period	18.59	20.50	20.57	21.09	21.74	24.31
INTERNATIONAL FINANCE						
International Reserves (US\$ Million)	1,061	2,459	1,959	2,059	2,324	2,993
External Debt (US\$ Million)	25,420	28,260	28,650	27,920	27,616	28,410 a/

a/ As of August

Sources: National Statistics Office;
Central Bank - International Economic Research.

Table 4.2 REPAIR AND REHABILITATION COST ESTIMATES OF EARTHQUAKE - DAMAGED INFRASTRUCTURE, BY REGION, November 1990

(In Million Pesos)

Region	Roads Bridges	School Buildings	Flood Control	Hospitals/ Public Bldg	Water Supply	Others	Total
NCR	4.1	35.1	0	3.0	0	0	42.2
Ilocos	2,272.0	287.3	512.6	-	82.9	45.7	3,200.6
CAR	817.9	169.5	90.1	50.3	49.5	1.3	1,178.5
Cagayan Valley	741.1	60.3	63.4	0.0	6.0	11.4	882.2
Central Luzon	1,091.9	179.3	203.5	86.2	32.9	29.9	1,623.6
Southern Tagalog	31.9	24.8	6.0	0.9	0.3	0.4	64.3
Total	4,958.9	756.3	875.6	140.4	171.6	88.7	6,991.4

Pangasinan	Roads Bridges	School Buildings	Flood Control	Hospitals/ Public Bldg	Water Supply	Others	Total
Pangasinan	1,142.3	113.6	32.5	-	62.8	0.8	1,356.7
Dagupan City	462.9	90.9	119.6	-	18.5	0.8	692.7
San Carlos City	10.7	0.5	-	-	-	-	11.2
Agno Office	-	-	260.4	-	-	-	260.4
	1,615.9	205.0	412.5	-	81.3	1.6	2,321.0
Ilocos	2,272.0	287.3	512.6	-	82.9	45.7	3,200.6
% of Ilocos	71.1	71.2	80.5	-	98.2	3.5	72.5

Source: Department of Public Works and Highways

Table 4.3 ACTUAL GDP AND GRDP (Ilocos Region), 1975-1992

(In Million Pesos, 1972 Constant Prices)

YEAR	GDP (Philippines)	GRDP (Ilocos) \1
1975	68,437	2,795
1976	73,922	2,821
1977	78,467	3,066
1978	82,784	3,076
1979	87,962	3,371
1980	92,568	3,500
1981	96,207	3,769
1982	98,999	3,983
1983	99,921	4,052
1984	93,927	3,903
1985	89,904	4,006
1986	91,180	4,266
1987	95,463	4,296
1988	101,450	4,534
1989	107,168	4,702
1990	109,890	4,645
1991 \2	111,868	4,743
1992 \2	116,119	4,854
Annual Compound Growth Rate:	3.16%	3.30%

Notes: \1 Ilocos Region including CAR Provinces
 \2 Estimated using projected growth rates from National
 Planning and Policy Staff, NEDA

Source of Data: National Statistical Coordination Board, National
 Economic and Development Authority

Table 4.4 (1/2) PROJECTED GDP AND GRDP (REGION I), 1993-2010

(In Million Pesos, 1972 Constant Prices)

YEAR	SCENARIOS					
	TREND GROWTH ¹²		HIGH GROWTH ¹³		MODIFIED GROWTH ¹⁴	
	GDP	GRDP	GDP	GRDP	GDP	GRDP
Actual:						
1989	107,168	3,388	107,168	3,388	107,168	3,388
1990	109,890	3,347	109,890	3,347	109,890	3,347
1991	111,868	3,417	111,868	3,417	111,868	3,417
1992	116,119	3,498	116,119	3,498	116,119	3,498
Projected:						
1993	119,787	3,613	124,015	3,680	121,901	3,646
1994	123,571	3,732	132,448	3,871	128,010	3,802
1995	127,474	3,856	141,455	4,072	134,465	3,964
1996	131,501	3,983	151,074	4,284	141,287	4,133
1997	135,655	4,114	161,347	4,507	148,501	4,311
1998	139,940	4,250	172,318	4,741	156,129	4,496
1999	144,361	4,390	184,036	4,988	164,198	4,689
2000	148,921	4,535	196,550	5,247	172,736	4,891
2001	153,625	4,685	211,488	5,541	182,557	5,113
2002	158,478	4,840	227,561	5,851	193,020	5,345
2003	163,484	4,999	244,856	6,179	204,170	5,589
2004	168,649	5,164	263,465	6,525	216,057	5,845
2005	173,976	5,335	283,488	6,890	228,732	6,113
2006	179,472	5,511	305,033	7,276	242,252	6,394
2007	185,141	5,693	328,216	7,684	256,678	6,688
2008	190,989	5,881	353,160	8,114	272,075	6,997
2009	197,022	6,075	380,000	8,568	288,511	7,322
2010	203,246	6,275	408,890	9,048	306,063	7,662
Compound Growth Rate:						
1992 to 2000	3.16%	3.30%	6.80%	5.20%	5.09%	4.28%
2000 to 2010	3.16%	3.30%	7.60%	5.60%	5.89%	4.59%

- Notes: ¹¹ Region I = Ilocos Region without CAR Provinces.
¹² Based on the compound growth rate derived in Table 4.3.
¹³ Based on compound growth rate used in Master Plan.
¹⁴ Midpoint between trend growth and high growth scenarios.

Source of Data: National Statistical Coordination Board, National Economic and Development Authority

Table 4.4 (2/2) PROJECTED GDP AND GRDP (REGION I), 1993-2010

(In Million Pesos, 1990 Constant Prices)

YEAR	SCENARIOS					
	TREND GROWTH \2		HIGH GROWTH \3		MODIFIED GROWTH \4	
	GDP	GRDP	GDP	GRDP	GDP	GRDP
Actual:						
1989	1,101,826	34,831	1,101,826	34,831	1,101,826	34,831
1990	1,129,812	34,413	1,129,812	34,413	1,129,812	34,413
1991	1,150,149	35,136	1,150,149	35,136	1,150,149	35,136
1992	1,193,854	35,961	1,193,854	35,961	1,193,854	35,961
Projected:						
1993	1,231,567	37,148	1,275,036	37,831	1,253,302	37,490
1994	1,270,470	38,374	1,361,739	39,799	1,316,105	39,087
1995	1,310,603	39,641	1,454,337	41,868	1,382,470	40,755
1996	1,352,003	40,949	1,553,232	44,045	1,452,618	42,497
1997	1,394,711	42,301	1,658,852	46,336	1,526,782	44,318
1998	1,438,769	43,697	1,771,654	48,745	1,605,211	46,221
1999	1,484,218	45,139	1,892,126	51,280	1,688,172	48,210
2000	1,531,102	46,629	2,020,791	53,946	1,775,947	50,288
2001	1,579,468	48,168	2,174,371	56,967	1,876,919	52,568
2002	1,629,361	49,758	2,339,623	60,158	1,984,492	54,958
2003	1,680,831	51,401	2,517,434	63,526	2,099,133	57,463
2004	1,733,926	53,097	2,708,759	67,084	2,221,343	60,090
2005	1,788,679	54,850	2,914,625	70,941	2,351,662	62,845
2006	1,845,202	56,660	3,136,137	74,808	2,490,669	65,734
2007	1,903,489	58,530	3,374,483	78,997	2,638,986	68,763
2008	1,963,618	60,462	3,630,944	83,421	2,797,281	71,941
2009	2,025,647	62,458	3,906,896	88,092	2,966,271	75,275
2010	2,089,634	64,519	4,203,820	93,025	3,146,727	78,772
Compound Growth Rate:						
1992 to 2000	3.16%	3.30%	6.80%	5.20%	5.09%	4.28%
2000 to 2010	3.16%	3.30%	7.50%	5.60%	5.89%	4.59%

Notes: \1 Region I = Ilocos Region without CAR Provinces.
 \2 Based on the compound growth rate derived in Table 4.3.
 \3 Based on compound growth rate used in Master Plan.
 \4 Midpoint between trend growth and high growth scenarios.

Source of Data: National Statistical Coordination Board, National Economic and Development Authority

Table 4.5 INCREMENTAL CAPITAL-OUTPUT RATIO (ICOR), PHILIPPINES,
ACTUAL AND ESTIMATED, 1985-1992

(In Million Pesos, 1972 Constant Prices)

YEAR	GDP (Output)	GDP Growth Rate	ICOR ¹	Capital- Output Ratio (In %) ²	GDCF (Capital)	Private Investment Magnitude	Public Investment Magnitude
1985	89,904			12.37%	11,124	8,782	2,342
1986	91,180	1.42%	8.29	11.17%	10,181	8,020	2,161
1987	95,463	4.70%	2.55	12.77%	12,190	9,905	2,285
1988	101,450	6.27%	2.27	15.70%	15,926	13,627	2,299
1989	107,168	5.64%	2.91	17.06%	18,283	15,754	2,529
1990	109,890	2.54%	6.62	16.56%	18,201	15,700	2,501
1991 ³	111,868	1.80%	9.08	16.11%	18,019	15,638	2,381
1992 ³	116,119	3.80%	4.28	16.42%	19,054	16,524	2,530

- Notes:
1. ICOR = Pesos worth of capital input for every peso of output; derived by dividing capital-output ratio by GDP growth rate.
 2. Capital-output ratio = GDP / GDCF.
 3. Projected using NEDA growth estimates.

Source of Data: National Statistical Coordination Board, National Economic and Development Authority

Table 4.6 PROJECTED INVESTMENT MAGNITUDES, PHILIPPINES
(MODIFIED GROWTH SCENARIO), 1993-2010

(In Million Pesos, 1972 Constant Prices)

YEAR	GDP (Output)	GDP Growth Rate	ICOR ¹²	Capital- Output Ratio (In %) ¹³	GDCF (Capital)	Private Investment Magnitude	Public Investment Magnitude ¹⁴
1993	121,827	4.92%	4.00	19.66%	23,952	20,245	3,708
1994	127,931	5.01%	4.00	20.04%	25,643	21,673	3,969
1995	134,382	5.04%	4.00	20.17%	27,105	22,909	4,196
1996	141,201	5.07%	4.00	20.30%	28,659	24,222	4,436
1997	148,410	5.11%	4.00	20.42%	30,309	25,617	4,692
1998	156,034	5.14%	4.00	20.55%	32,061	27,098	4,963
1999	164,098	5.17%	4.00	20.67%	33,924	28,672	5,251
2000	172,630	5.20%	4.00	20.80%	35,903	30,345	5,558
2001	182,445	5.69%	4.00	22.74%	41,492	35,069	6,423
2002	192,902	5.73%	4.00	22.93%	44,223	37,378	6,846
2003	204,045	5.78%	4.00	23.11%	47,149	39,851	7,298
2004	215,925	5.82%	4.00	23.29%	50,284	42,500	7,784
2005	228,592	5.87%	4.00	23.47%	53,643	45,339	8,304
2006	242,104	5.91%	4.00	23.64%	57,243	48,382	8,861
2007	256,521	5.95%	4.00	23.82%	61,102	51,644	9,458
2008	271,908	6.00%	4.00	23.99%	65,240	55,141	10,099
2009	288,335	6.04%	4.00	24.16%	69,676	58,890	10,786
2010	305,876	6.08%	4.00	24.33%	74,433	62,911	11,522

Notes: ¹¹ Using modified growth scenario projections.
¹² ICOR = Pesos worth of capital input for every peso of output; assumed to be P4.
¹³ Capital-output ratio = GDP growth rate x ICOR
¹⁴ Assumed to be 15.5% of GDCF.

Source of Data: National Statistical Coordination Board, National Economic and Development Authority

Table 4.7 PROJECTED INVESTMENT MAGNITUDES,
ILOCOS (MODIFIED GROWTH SCENARIO), 1993-2010

(In Million Pesos, 1972 Constant Prices)

YEAR	GRDP (Output)	GRDP Growth Rate	ICOR ¹ 2	Capital- Output Ratio (In %) ¹ 3	GROCF (Capital)	Private Investment Magnitude ¹ 4	Public Investment Magnitude ¹ 4
1993	3,646	4.25%	4.00	17.00%	620	524	96
1994	3,802	4.26%	4.00	17.04%	648	547	100
1995	3,964	4.27%	4.00	17.07%	677	572	105
1996	4,133	4.29%	4.00	17.11%	707	598	109
1997	4,311	4.29%	4.00	17.14%	739	624	114
1998	4,496	4.29%	4.00	17.17%	772	653	120
1999	4,689	4.30%	4.00	17.21%	807	682	125
2000	4,891	4.31%	4.00	17.24%	843	713	131
2001	5,113	4.53%	4.00	18.14%	927	784	144
2002	5,345	4.55%	4.00	18.19%	972	822	150
2003	5,589	4.56%	4.00	18.24%	1,019	861	158
2004	5,845	4.57%	4.00	18.29%	1,069	903	165
2005	6,113	4.58%	4.00	18.34%	1,121	947	173
2006	6,394	4.60%	4.00	18.39%	1,176	994	182
2007	6,688	4.61%	4.00	18.44%	1,233	1,042	191
2008	6,997	4.62%	4.00	18.49%	1,293	1,093	200
2009	7,322	4.63%	4.00	18.54%	1,357	1,147	210
2010	7,662	4.65%	4.00	18.58%	1,424	1,203	220

- Notes: ¹1 Using modified growth scenario projections.
¹2 ICOR = Pesos worth of capital input for every peso of output; assumed to be P4.
¹3 Capital-output ratio = GRDP growth rate x ICOR
¹4 Assumed to be 15.5% of GROCF.

Source of Data: National Statistical Coordination Board, National Economic and Development Authority

Table 4.8 (1/2) PROJECTED POPULATION BY GROWTH CENTER GROUPING,
1995,2000,2005 AND 2010

Growth Center Grouping City/Town	Impact Area				Beneficial Area			
	1995	2000	2005	2010	1990	2000	2005	2010
A. DAGUPAN CITY/SAN CARLOS CITY								
Dagupan City	125,465	134,369	142,317	148,752	125,465	134,369	142,317	148,752
San Carlos City	129,163	138,330	146,513	153,137	103,237	110,564	117,105	122,399
Malasiqui	90,459	96,879	102,609	107,249	65,529	70,180	74,331	77,692
Bayambang	81,697	87,495	92,670	96,860	61,925	66,319	70,242	73,418
Mangaldan	65,531	70,541	75,060	78,779	65,531	70,541	75,060	78,779
Calasiao	65,365	71,250	76,679	81,297	65,365	71,250	76,679	81,297
Rinmaley	60,385	64,671	68,496	71,593	60,385	64,671	68,496	71,593
San Fabian	53,606	57,410	60,806	63,555	6,382	6,835	7,239	7,566
Santa Barbara	47,132	50,456	53,419	55,815	42,017	44,980	47,622	49,758
San Jacinto	26,465	28,394	30,122	31,530	18,952	20,333	21,571	22,579
Mapandan	25,635	27,455	29,079	30,394	25,635	27,455	29,079	30,394
Bautista	23,210	24,903	26,420	27,656	1,103	1,183	1,255	1,314
Sub-total:	794,113	852,153	904,190	946,617	641,525	688,681	730,995	765,541
B. URDANETA								
Urdaneta	95,540	103,534	110,833	116,953	87,644	94,977	101,673	107,287
Villasis	50,924	54,843	58,381	61,297	40,309	43,411	46,212	48,520
Pozzorubio	48,542	51,909	54,903	57,315	11,540	12,341	13,053	13,626
Manaoag	51,708	56,919	61,801	66,044	36,120	39,760	43,170	46,134
Binalonan	42,555	44,762	46,645	48,051	33,452	35,187	36,667	37,772
Sison	31,308	33,337	35,124	36,542	3,845	4,095	4,314	4,488
Alcala	31,885	34,148	36,168	37,804	11,356	12,162	12,882	13,464
Laoac	26,792	29,400	31,831	33,931	26,792	29,400	31,831	33,931
Basista	21,932	23,488	24,878	26,003	21,932	23,488	24,878	26,003
Santo Tomas	10,882	11,500	12,034	12,444	6,555	6,928	7,249	7,496
Sub-total:	412,068	443,840	472,598	496,384	279,546	301,749	321,929	338,722
C. TAYUG								
Tayug	32,442	34,429	36,166	37,524	9,486	10,067	10,575	10,972
Umingan	52,771	56,516	59,859	62,566				
Asingan	43,694	45,692	47,362	48,559	43,694	45,692	47,362	48,559
Rosales	46,670	49,983	52,939	55,333	5,458	5,846	6,192	6,472
San Manuel	37,672	40,310	42,660	44,557	14,652	15,678	16,592	17,330
San Nicolas	28,326	29,951	31,358	32,439	135	142	149	154
San Quintin	25,628	27,168	28,510	29,555				
Santa Maria	24,263	25,985	27,522	28,766	9,775	10,469	11,088	11,589
Balungao	22,124	23,695	25,096	26,231				
Natividad	18,563	19,623	20,540	21,244				
Sub-total:	332,153	353,352	372,012	386,774	83,200	87,894	91,958	95,076

Table 4.8 (2/2) PROJECTED POPULATION BY GROWTH CENTER GROUPING,
1995, 2000, 2005 AND 2010

Growth Center Grouping City/Town	Impact Area				Beneficial Area			
	1995	2000	2005	2010	1990	2000	2005	2010
D. LINGAYEN								
Lingsayen	83,164	89,066	94,335	98,600	35,624	38,152	40,409	42,236
Mangatarem	51,959	55,702	59,050	61,770				
Bugallon	51,038	55,022	58,626	61,604				
Urbiztondo	37,618	41,146	44,417	47,222	26,673	29,174	31,494	33,483
Aguilar	28,770	30,994	33,003	34,659				
Sual	21,323	23,200	24,926	26,388				
Labrador	14,993	15,919	16,730	17,365				
Sub-total:	288,865	311,049	331,087	347,608	62,297	67,327	71,903	75,719
E. ALAMINOS								
Alaminos	60,874	65,194	69,050	72,172				
Bolinao	52,247	56,590	60,551	63,868				
Bani	36,914	39,471	41,745	43,576				
Anda	26,095	27,947	29,600	30,938				
Agao	22,010	23,576	24,975	26,108				
Basol	23,364	25,567	27,612	29,366				
Mabini	20,386	21,832	23,124	24,169				
Burgos	16,352	17,512	18,548	19,387				
Infanta	15,721	16,837	17,833	18,639				
Sub-total:	273,963	294,526	313,038	328,223	0	0	0	0
F. OUTSIDE PANGASINAN								
Anao, Tarlac	8,411	9,002	9,520	9,935				
Caailang, Tarlac	62,991	65,599	67,677	69,081	448	467	482	492
Cuyapo, Nueva Ecija	53,621	58,180	62,291	65,748				
Mancada, Tarlac	45,206	48,615	51,635	54,093				
San Manuel, Tarlac	17,523	18,790	19,906	20,805				
Rosario, La Union	44,147	49,401	54,440	59,075	6,064	6,786	7,478	8,115
Nampicuan, Nueva Ecija	10,114	10,926	11,653	12,256				
Sub-total	242,013	260,514	277,122	290,993	6,512	7,253	7,960	8,606
TOTAL PANGASINAN	2,101,162	2,254,920	2,392,925	2,505,606				
TOTAL IMPACT AREA	2,343,175	2,515,434	2,670,047	2,796,599				
TOTAL BENEFICIAL AREA (As defined):					1,073,081	1,152,903	1,224,744	1,283,644

Source of Data: National Statistics Office

Table 4.9 PROJECTED INFRASTRUCTURE SPENDING IN ILOCOS AND PANGASINAN, 1991-2010

(In Thousand Pesos)

	Ilocos GRDP	Ilocos Infra Spending	Pangasinan Infra Spending	Pangasinan Flood Control Spending	% of Pangasinan to Ilocos	% of Pang. Flood Control to Pangasinan
Actual						
1988		387,303	194,968	60,630	50.3%	31.1%
1989	34,831,000	583,149	306,117	47,457	52.5%	15.5%
1990	34,413,000	658,379	286,891	97,705	43.6%	34.1%
Projected (Constant 1990 Prices)						
1991	35,136,000	1,229,760	614,880	153,720	50.0%	25.0%
1992	35,961,000	1,258,635	629,318	157,329	50.0%	25.0%
1993	37,490,000	1,312,150	656,075	164,019	50.0%	25.0%
1994	39,087,000	1,368,045	684,023	171,006	50.0%	25.0%
1995	40,755,000	1,426,425	713,213	178,303	50.0%	25.0%
1996	42,497,000	1,487,395	743,698	185,924	50.0%	25.0%
1997	44,318,000	1,551,130	775,565	193,891	50.0%	25.0%
1998	46,221,000	1,617,735	808,868	202,217	50.0%	25.0%
1999	48,210,000	1,687,350	843,675	210,919	50.0%	25.0%
2000	50,288,000	1,760,080	880,040	220,010	50.0%	25.0%
2001	52,568,000	1,839,880	919,940	229,985	50.0%	25.0%
2002	54,958,000	1,923,530	961,765	240,441	50.0%	25.0%
2003	57,463,000	2,011,205	1,005,603	251,401	50.0%	25.0%
2004	60,090,000	2,103,150	1,051,575	262,894	50.0%	25.0%
2005	62,845,000	2,199,575	1,099,788	274,947	50.0%	25.0%
2006	65,734,000	2,300,690	1,150,345	287,586	50.0%	25.0%
2007	68,763,000	2,406,705	1,203,353	300,838	50.0%	25.0%
2008	71,941,000	2,517,935	1,258,968	314,742	50.0%	25.0%
2009	75,235,000	2,633,225	1,316,613	329,153	50.0%	25.0%
2010	78,772,000	2,757,020	1,378,510	344,628	50.0%	25.0%

- Notes: 1/ Ilocos infrastructure spending raised to 3.5% of GDP
2/ Share of Pangasinan's infrastructure spending to Ilocos at 50%
3/ Share of Flood Control to Pangasinan at 25%

Source of Basic Data: Department of Public Works and Highways.

Table 5.1 COMPARATIVE PRODUCTIVITY RATIOS, FORWARD LINKAGES, BACKWARD LINKAGES
(66x66 Matrix)

No.	Sector	Productivity Ratios	Forward Linkage	Backward Linkage
01	Palay	3.3087041	0.9456760	0.7184800
02	Corn	5.2930246	1.0761880	0.6534710
03	Coconut	3.9058876	1.2548060	0.6496790
04	Sugarcane	3.9859292	0.8963300	0.6913760
05	Banana	3.1314005	0.5477930	0.7185540
06	Other Crops	8.4496870	1.3268250	0.5842440
07	Livestock and Livestock Products	0.8259468	1.0714870	1.0717860
08	Poultry and Poultry Products	1.0660706	0.9507160	0.9987560
09	Fishery	3.5305003	0.8175190	0.7078890
10	Forestry and Logging	4.5529709	1.2465730	0.6553670
11	Metallic Mining	2.2327382	0.7084770	0.8180580
12	Non-metallic Mining, Quarrying	2.7158114	2.8827590	0.7635690
13	Rice and Corn Milling	0.3316375	0.7404980	1.0501630
14	Sugar Milling and Refining	0.2907778	0.5967020	1.0612120
15	Milk and Other Dairy Products	0.4348898	0.7475700	1.2894460
16	Coconut Oil, Cake, Meal	0.3555629	1.4331510	1.0974760
17	Refined Coconut Oil, Margarina	0.3699224	0.6500210	1.2735260
18	Meat and Meat Products	0.3143739	0.8913870	1.2786110
19	Flour and Grain Mill Prod	0.1839710	0.7977840	1.1497250
20	Animal Feeds	0.2776579	1.0775790	1.1473380
21	Other Processed Foods	0.4214017	0.8900050	1.1511590
22	Beverage Industries	1.0302320	0.6143680	1.0076980
23	Tobacco Manufactures	0.6927624	0.7316860	1.0728600
24	Textiles and Textile Goods	0.6250617	1.0130740	1.1065890
25	Wearing Apparel and Footwear	0.8857998	0.5240790	1.0659270
26	Lumber, Plywood and Veneer	0.3422074	0.9165480	1.0639590
27	Other Wood, Cork, Cane Products	0.6862278	0.5125240	1.0222860
28	Furniture and Fixtures	0.5374470	0.5014660	1.1762430
29	Paper and Paper Products	0.4595964	1.2266640	1.2335460
30	Publishing and Printing	0.6960880	0.6277040	1.1612340
31	Leather and Leather Products	0.5096154	0.5789780	1.2783760
32	Rubber and Plastic Products	0.4499588	1.4899810	1.2131700
33	Drugs and Medicines	0.5234637	0.6779900	1.1929550
34	Basic Industrial Chemicals	0.5994795	1.8452160	1.1608330
35	Fertilizers	0.4718788	0.7973100	1.2085930
36	Other Chemical Products	0.6492292	0.9007700	1.1462190
37	Petroleum Products	0.5026161	4.3504970	1.0173080
38	Cement Manufactures	0.5053353	0.5832110	1.1279530
39	Other Non-metallic Mineral Prod	0.8974219	0.6975340	0.9954980
40	Basic Metal Industries	0.3685494	2.1503930	1.3355280
41	Metal Products	0.4838983	0.9641860	1.3064950
42	Machinery except Electrical	0.7204940	0.6501350	1.1716900
43	Electrical Machinery	0.5780221	1.0353140	1.2001010
44	Transport Equipment	0.5924274	0.8419910	1.1980360
45	Miscellaneous Manufactures	0.6458351	0.7911260	1.0873340
46	Construction	1.1452294	0.6248460	1.0026320
47	Electricity	0.4841199	1.6769640	1.1650190
48	Gas and Steam	0.4948454	0.5057390	1.1639560
49	Water Works	1.1484321	0.5720190	1.0078550
50	Busline Operations	0.7850841	0.5247530	1.0797730
51	Other Passenger Land Transport	0.9277392	0.5450250	1.0390570
52	Road Freight Transport	1.2507235	1.2172270	0.9510980
53	Water Transport	1.1471240	0.7679410	0.9562390
54	Air Transport	1.0341830	0.5458610	0.9775710
55	Allied Transport Services	1.5497875	0.7600350	0.8561080
56	Communications	2.1450543	0.7504660	0.8026290
57	Storage and Warehousing	1.9338572	0.5127560	0.8388880
58	Wholesale and Retail Trade	3.5344005	4.0984640	0.6975230
59	Banks, Non-Banks, Insurance	3.5869832	0.6813910	0.7037800
60	Real Estate and Ownership	8.3191893	0.6417200	0.6018530
61	Government Services		0.4993760	0.4993760
62	Private Education Services	2.3851447	0.5988360	0.7683960
63	Private Health Services	1.9001886	0.5603880	0.8617970
64	Hotels and Restaurants	0.5644360	0.7398610	1.1440750
65	Other Private Services	2.1954604	1.4237090	0.8022300
66	Notional Industry			

Source: The Interindustry Accounts of the Philippines: 1983 Update
National Economic and Development Authority

Table 5.2 FORWARD AND BACKWARD LINKAGE INVERSE COEFFICIENTS
(66x66 Matrix)

Sector	Forward Linkage Inverse Coeff	Sector	Backward Linkage Inverse Coeff
Construction	1.0051389	Construction	1.0051389
Non-metallic Mining, Quarrying	0.0169428	Basic Metal Industries	0.1519037
Real Estate and Ownership	0.0120229	Petroleum Products	0.1012687
Other Private Services	0.0118756	Wholesale and Retail Trade	0.1010871
Petroleum Products	0.0099147	Lumber, Plywood and Veneer	0.0862540
Sugarcane	0.0092281	Non-metallic Mining, Quarrying	0.0793921
Wholesale and Retail Trade	0.0080605	Metal Products	0.0592481
Cement Manufactures	0.0076568	Forestry and Logging	0.0528918
Corn	0.0073314	Other Non-metallic Mineral Prod	0.0402920
Paper and Paper Products	0.0069918	Cement Manufactures	0.0391879
Electricity	0.0068821	Electrical Machinery	0.0338478
Other Passenger Land Transport	0.0067155	Electricity	0.0320999
Other Non-metallic Mineral Prod	0.0066986	Other Chemical Products	0.0299386
Basic Metal Industries	0.0062743	Other Private Services	0.0251937
Storage and Warehousing	0.0059455	Rubber and Plastic Products	0.0206650
Gas and Steam	0.0057865	Road Freight Transport	0.0185106
Hotels and Restaurants	0.0057573	Basic Industrial Chemicals	0.0182614
Coconut	0.0053651	Metallic Mining	0.0145399
Metal Products	0.0050705	Other Wood, Cork, Cane Products	0.0132646
Busline Operations	0.0050577	Coconut Oil, Cake, Meal	0.0112092
Metallic Mining	0.0049078	Banks, Non-Banks, Insurance	0.0087945
Other Crops	0.0046815	Water Transport	0.0064322
Publishing and Printing	0.0046343	Miscellaneous Manufactures	0.0057457
Transport Equipment	0.0043300	Paper and Paper Products	0.0052984
Electrical Machinery	0.0043267	Communications	0.0052160
Fertilizers	0.0042326	Coconut	0.0050451
Poultry and Poultry Products	0.0040692	Hotels and Restaurants	0.0039968
Machinery except Electrical	0.0039549	Machinery except Electrical	0.0035980
Drugs and Medicines	0.0039397	Real Estate and Ownership	0.0028876
Communications	0.0039167	Other Crops	0.0025726
Road Freight Transport	0.0036520	Transport Equipment	0.0023508
Rubber and Plastic Products	0.0033075	Allied Transport Services	0.0021083
Basic Industrial Chemicals	0.0032695	Publishing and Printing	0.0020872
Water Transport	0.0030151	Other Processed Foods	0.0018671
Allied Transport Services	0.0029892	Fishery	0.0015822
Banks, Non-Banks, Insurance	0.0028399	Air Transport	0.0015630
Miscellaneous Manufactures	0.0028381	Other Passenger Land Transport	0.0015518
Air Transport	0.0027945	Water Works	0.0015112
Water Works	0.0026482	Private Health Services	0.0014236
Private Health Services	0.0026470	Textiles and Textile Goods	0.0013816
Private Education Services	0.0026107	Poultry and Poultry Products	0.0007823
Refined Coconut Oil, Margarine	0.0026019	Meat and Meat Products	0.0007788
Milk and Other Dairy Products	0.0025207	Busline Operations	0.0007531
Lumber, Plywood and Veneer	0.0024889	Rice and Corn Milling	0.0005112
Coconut Oil, Cake, Meal	0.0024716	Private Education Services	0.0004108
Other Chemical Products	0.0024451	Livestock and Livestock Products	0.0003768
Textiles and Textile Goods	0.0024256	Wearing Apparel and Footwear	0.0003603
Furniture and Fixtures	0.0024107	Flour and Grain Mill Prod	0.0003200
Tobacco Manufactures	0.0023535	Animal Feeds	0.0003042
Meat and Meat Products	0.0023498	Palay	0.0002964
Leather and Leather Products	0.0022426	Corn	0.0002237
Sugar Milling and Refining	0.0021538	Refined Coconut Oil, Margarine	0.0002161
Other Processed Foods	0.0020506	Drugs and Medicines	0.0002126
Other Wood, Cork, Cane Products	0.0019975	Fertilizers	0.0001706
Wearing Apparel and Footwear	0.0018761	Storage and Warehousing	0.0001628
Flour and Grain Mill Prod	0.0016829	Sugar Milling and Refining	0.0001407
Animal Feeds	0.0016534	Milk and Other Dairy Products	0.0001345
Rice and Corn Milling	0.0015811	Furniture and Fixtures	0.0001064
Livestock and Livestock Products	0.0015501	Beverage Industries	0.0001008
Beverage Industries	0.0014459	Sugarcane	0.0000897
Fishery	0.0013442	Leather and Leather Products	0.0000646
Forestry and Logging	0.0010316	Gas and Steam	0.0000340
Palay	0.0010214	Banana	0.0000111
Banana	0.0010048	Tobacco Manufactures	0.0000000
Government Services	0.0000000	Government Services	0.0000000
Notional Industry		Notional Industry	

Source: The Interindustry Accounts of the Philippines: 1983 Update
National Economic and Development Authority

Table 5.3 ESTIMATES OF INCREMENTAL LAND APPRECIATION

Land Use Type	Appraised Land Values (P/ha)	Transactions Land Prices (P/ha)	Upper Agno	Land Area by River Basin		Total Land Area
				Pantal-Sinocalan	Cayanga-Patalan	
Urban Commercial/ Residential	600,000	4,000,000		59		59
Settlements	200,000	800,000	1,440	6,947	1,636	10,023
Farmland						
Irrigated Paddy	18,000	140,000	5,202	11,899	3,712	20,813
Rainfed Paddy	15,000	100,000	4,188	29,599	4,036	37,823
Other Crops	12,000	50,000	3,454	9,381	2,144	14,979
Fishpond	30,000	300,000	28	5,050	142	5,220
Others	15,000	80,000	3,688	24,704	8,780	37,172
Total			18,000	87,580	20,450	126,030

Land Use Type	Difference (P/ha)	Incremental Land Values (P/ha)	Upper Agno	Potential Land Appreciation		Total
				Pantal-Sinocalan	Cayanga-Patalan	
Urban Commercial/ Residential	3,400,000	170,000	0	10,064,000	0	10,064,000
Settlements	600,000	30,000	43,200,000	208,416,000	49,080,000	300,696,000
Farmland						
Irrigated Paddy	122,000	6,100	31,732,200	72,583,900	22,643,200	126,959,300
Rainfed Paddy	85,000	4,250	17,799,000	125,795,750	17,153,000	160,747,750
Other Crops	38,000	1,900	6,562,600	17,823,900	4,073,600	28,460,100
Fishpond	270,000	13,500	378,000	68,175,000	1,917,000	70,470,000
Others	65,000	3,250	11,986,000	80,287,350	28,535,000	120,808,350
Total			111,657,800	583,145,900	123,401,800	818,205,500
Ave Increase/Ha			6,203	6,658	6,034	6,492

Source: Compensation Cost Estimates; City/Municipal Profiles (1989), Department of Agriculture Region I; Socio-Economic Profiles of Pangasinan, Dagupan City, San Carlos City.

Notes: Urban commercial/ residential areas defined as area of Central Business Districts of Dagupan and San Carlos cities.

Settlements consist of residential, commercial, institutional, industrial, transport and utilities area. Set at 8% of land area as derived from Pangasinan land use as derived from socio-economic profiles, adjusted for probable shifts as seen in City/Municipal Profiles.

Farms/fishponds land use derived from City/Municipal Profiles.

Unit land values based on Compensation Cost Estimates. Incremental land values taken as difference between transactions and appraised values, divided over an assumed appreciation pe

Table 5.4
IRRIGATION PROFILE

Irrigation Systems/Coverage	Service Area	Irrigated Area Wet Season	Irrigation Intensity (%)
National Irrigation Systems in Impact Area			
Agno River Irrigation System San Manuel, Asingan, Laoac, Binalonan, Urdaneta, Manaoag, Villasis, Mapandan, Sta. Barbara. Malasiqui.	17,173	2,109	12%
Sinocalan Extension River Irrigation System Sta. Barbara, Galasiao, Mangaldan.	3,000	163	5%
Ambacayan-Dipalo River Irrigation System San Nicolas, Natividad, Tayug, San Quintin, Umingan, Balungao, Sta. Maria.	6,302	4,738	75%
Lower Agno-Totogonen River Irrigation System Rosales, Balingao, Sto. Tomas, Alcala, Bautista	7,623	4,644	61%
San Fabian-Dumuloc River Irrigation System San Fabian, San Jacinto	4,142	2,840	69%
Camiling Irrigation System	8,580	6,790	79%
Sub-Total	46,820	21,284	45%
Communal Irrigation Systems in Feasibility Study Area			
Asingan	2,685	2,685	100%
Binalonan	2,329	2,167	93%
Laoac	745	745	100%
Malasiqui	1,602	1,356	85%
Manaoag	301	301	100%
Mangaldan	230	70	30%
Mapandan	903	320	35%
Pozorrubio	2,842	2,292	81%
Rosales	124	124	100%
San Fabian	2,776	2,776	100%
San Manuel	2,339	2,274	97%
San Nicolas	4,222	4,128	98%
Sta. Maria	1,007	1,007	100%
Sison	2,823	2,317	82%
Villasis	112	112	100%
Camiling, Tarlac	110	110	100%
Rosario, La Union	914	824	90%
Sub-Total	26,065	23,609	91%
Total	72,885	44,893	62%

Source: National Irrigation Administration

Table 5.5 (1/4) AREA HARVESTED, PRODUCTION, AND PRODUCTIVITY
OF CEREALS, SELECTED CROPS, AND FISHERIES -
PANGASINAN, 1986-1990

	Unit	1986	1987	1988	1989	1990
CEREALS:						
Rice						
Area	ha	203,360	194,490	204,200	196,050	194,210
Production	mt	544,750	504,962	571,284	547,880	585,117
Productivity	mt/ha	2.68	2.60	2.80	2.79	3.01
Irrigated						
Area	ha	92,930	112,050	108,040	98,580	101,370
Production	mt	269,895	325,309	313,507	286,099	311,211
Productivity	mt/ha	2.90	2.90	2.90	2.90	3.07
Rainfed						
Area	ha	110,430	82,440	96,160	97,470	92,840
Production	mt	274,855	179,653	257,777	261,781	273,906
Productivity	mt/ha	2.49	2.18	2.68	2.69	2.95
Corn						
Area	ha	49,370	53,560	55,300	53,440	58,190
Production	mt	46,255	53,215	56,655	54,415	70,560
Productivity	mt/ha	0.94	0.99	1.02	1.02	1.21
SELECTED CROPS:						
Banana						
Area	ha	6,502	6,550	6,590	6,583	6,652
Production	kg	42,240,660	44,274,387	40,481,136	42,288,489	43,080,225
Productivity	mt/ha	6.50	6.76	6.14	6.42	6.48
Cacao						
Area	ha	125	125	120	114	109
Production	kg	60,020	60,040	60,050	60,454	60,464
Productivity	mt/ha	0.48	0.48	0.50	0.53	0.55
Calamansi						
Area	ha	970	930	930	895	908
Production	kg	2,423,873	2,713,695	2,493,831	3,057,122	3,098,440
Productivity	mt/ha	2.50	2.92	2.68	3.42	3.41
Camote						
Area	ha	1,954	1,963	1,961	2,122	2,303
Production	kg	8,820,380	8,940,095	7,995,920	9,410,500	10,657,500
Productivity	mt/ha	4.51	4.55	4.08	4.43	4.63

Table 5.5 (2/4) AREA HARVESTED, PRODUCTION, AND PRODUCTIVITY OF CEREALS, SELECTED CROPS, AND FISHERIES - PANGASINAN, 1986-1990

	Unit	1986	1987	1988	1989	1990
Cashew						
Area	ha	551	554	560	563	570
Production	kg	1,210,725	1,295,121	1,210,259	1,281,877	1,197,883
Productivity	mt/ha	2.20	2.34	2.16	2.28	2.10
Cassava						
Area	ha	1,512	1,520	1,490	1,286	1,257
Production	kg	9,894,618	9,652,669	8,767,753	8,604,460	7,839,750
Productivity	mt/ha	6.54	6.35	5.88	6.69	6.24
Coconut						
Area	ha	10,093	9,909	9,611	9,442	9,453
Production	kg	89,303,221	87,643,370	78,064,381	73,775,506	74,616,884
Productivity	mt/ha	8.85	8.84	8.12	7.81	7.89
Coffee						
Area	ha	10	10	10	10	
Production	kg	5,500	5,500	5,815	6,253	
Productivity	mt/ha	0.55	0.55	0.58	0.63	
Eggplant						
Area	ha	3,413	3,425	3,412	3,624	3,620
Production	kg	27,878,030	28,885,055	29,165,024	29,457,195	29,583,318
Productivity	mt/ha	8.17	8.43	8.55	8.13	8.17
Gabi						
Area	ha	118	120	80	87	
Production	kg	584,180	588,200	388,500	418,570	
Productivity	mt/ha	4.95	4.90	4.86	4.81	
Ginger						
Area	ha	26	26	26	16	20
Production	kg	82,160	82,680	81,000	50,910	63,700
Productivity	mt/ha	3.16	3.18	3.12	3.18	3.19
Mango						
Area	ha	6,925	7,225	7,225	7,147	7,147
Production	kg	59,972,000	58,881,250	64,464,000	63,986,120	52,345,040
Productivity	mt/ha	8.66	8.15	8.92	8.95	7.32
Mungo						
Area	ha	8,877	8,888	9,158	8,708	8,843
Production	kg	10,034,820	10,046,100	10,277,440	8,799,741	9,103,440
Productivity	mt/ha	1.13	1.13	1.12	1.01	1.03

Table 5.5 (3/4) AREA HARVESTED, PRODUCTION, AND PRODUCTIVITY
OF CEREALS, SELECTED CROPS, AND FISHERIES -
PANGASINAN, 1986-1990

	Unit	1986	1987	1988	1989	1990
Mustard						
Area	ha	20	20	21	24	21
Production	kg	55,468	56,670	57,720	66,380	64,060
Productivity	mt/ha	2.77	2.83	2.75	2.77	3.05
Onion						
Area	ha	822	836	820	619	857
Production	kg	9,491,407	9,548,162	9,968,630	8,206,560	11,922,260
Productivity	mt/ha	11.55	11.42	12.16	13.26	13.91
Papaya						
Area	ha	90	92	92	97	109
Production	kg	2,014,058	2,046,673	2,069,876	2,137,077	2,121,605
Productivity	mt/ha	22.38	24.96	22.50	22.03	19.46
Patola						
Area	ha	194	197	187	281	310
Production	kg	505,279	510,482	619,025	761,001	935,455
Productivity	mt/ha	2.60	2.59	3.31	2.71	2.70
Peanuts						
Area	ha	4,259	4,293	4,270	4,242	4,910
Production	kg	7,498,464	7,366,600	6,520,600	6,203,982	6,398,880
Productivity	mt/ha	1.76	1.72	1.53	1.46	1.30
Pechay						
Area	ha	32	34	33	45	55
Production	kg	64,590	75,502	69,760	86,100	103,460
Productivity	mt/ha	2.02	2.22	2.08	1.91	1.88
Pineapple						
Area	ha	65	65	65	69	43
Production	kg	578,600	577,700	577,920	453,000	348,801
Productivity	mt/ha	8.90	8.89	8.89	6.57	8.11
Radish						
Area	ha	16	19	16	14	
Production	kg	164,522	187,502	150,880	130,200	
Productivity	mt/ha	10.28	9.87	9.43	9.30	
Squash						
Area	ha	288	288	300	345	
Production	kg	2,099,790	2,181,960	2,293,620	2,636,210	
Productivity	mt/ha	7.50	7.51	7.65	7.64	

Table 5.5 (4/4) AREA HARVESTED, PRODUCTION, AND PRODUCTIVITY OF CEREALS, SELECTED CROPS, AND FISHERIES - PANGASINAN, 1986-1990

	Unit	1986	1987	1988	1989	1990
Tobacco						
Area	ha	7,289	7,593	7,991	6,142	14,194
Production	kg	8,985,246	14,553,760	16,328,512	12,441,500	14,901,854
Productivity	mt/ha	1.23	1.92	2.04	2.03	1.05
Togoe						
Area	ha	827	760	483	445	
Production	kg	1,928,350	1,833,960	1,346,400	1,195,410	
Productivity	mt/ha	2.33	2.54	2.79	2.69	
Tomato						
Area	ha	4,167	4,193	4,179	4,391	4,370
Production	kg	48,978,677	49,258,665	49,440,525	50,581,488	50,588,579
Productivity	mt/ha	11.75	11.74	11.83	11.52	11.57
Watermelon						
Area	ha	388	449	449	577	523
Production	kg	13,749,000	14,683,500	15,172,000	17,496,000	15,854,173
Productivity	mt/ha	35.49	32.70	33.79	30.32	30.31
FISHERIES:						
Freshwater						
Area	ha	957	957	957	957	
Production	mt	1,007	1,435	1,445	1,469	
Productivity	mt/ha	1.05	1.50	1.51	1.53	
Brackishwater						
Area	ha	15,451	15,451	15,451	15,451	
Production	mt	21,630	23,176	16,686	25,095	
Productivity	mt/ha	1.40	1.50	1.08	1.62	

Source: Bureau of Agricultural Statistics

TABLE 5.6
ESTIMATES OF INCREMENTAL PRODUCTION YIELD AND FARM INCOME

Agricultural Land Use By River Basin	Area (ha)	Average Production Yield W/O Proj (Mt/ha)	Average Production Yield With Proj (Mt/ha)	Assumed Price (P/Mt)	Incremental Net Income
Upper Agno					
Paddy					
Irrigated	5,202	2.93	4.50	3,780	30,793,135
Rainfed	4,188	2.60	2.80	3,780	3,197,789
Other Crops					
Sugarcane	7	0.01	60.00	235	98,684
Corn	1,462	1.04	3.00	4,080	11,715,181
Legume	700	1.08	1.50	14,650	4,266,080
Total	11,559				50,070,869
Pantal-Sinocalan					
Paddy					
Irrigated	11,899	2.93	4.50	3,780	70,435,893
Rainfed	29,599	2.60	2.80	3,780	22,600,612
Other Crops					
Sugarcane	358	0.01	60.00	235	5,046,959
Corn	3,305	1.04	3.00	4,080	26,483,362
Legume	1,944	1.08	1.50	14,650	11,847,514
Total	47,105				136,414,339
Cayanga-Patalan					
Paddy					
Irrigated	3,712	2.93	4.50	3,780	21,973,110
Rainfed	4,036	2.60	2.80	3,780	3,081,728
Other Crops					
Sugarcane	228	0.01	60.00	235	3,214,264
Corn	602	1.04	3.00	4,080	4,823,898
Legume	412	1.08	1.50	14,650	2,510,893
Total	8,990				35,603,893
All Basins					
Paddy					
Irrigated	20,813	2.93	4.50	3,780	123,202,137
Rainfed	37,823	2.60	2.80	3,780	28,880,130
Other Crops					
Sugarcane	593	0.01	60.00	235	8,359,906
Corn	5,369	1.04	3.00	4,080	43,022,441
Legume	3,056	1.08	1.50	14,650	18,624,486
Total	67,654				222,089,101

Source of Basic Data: Bureau of Agricultural Statistics.

Notes: Actual Production Yields based on Crop Years 1986-1990.
Land Use, Potential Production Yield and Price Assumptions based on Flood Damage Analysis.
Tobacco, root crop and other crops excluded from analysis.

Table 6.1 COST-BENEFIT ANALYSIS: AGNO RIVER BASIN FLOOD CONTROL PROJECT
CASE A1: UPPER AGNO PROJECT (CONSTANT GROWTH CONDITION)

ASSUMPTIONS (1991 Prices)		Upper Agno	GROWTH FACTOR	
PROJECT COSTS				1.000
Main Constr Costs		2,324	2000	1.000
Other Costs		1,152	2010	1.000
Total Costs		3,476	2045	1.000
ANNUAL BENEFITS				
1989 Prices		283	CALCULATED EIRR	10.32%
1991 Prices		375	CALCULATED NPV	(532)

No.	Year	Cost Stream		Total	Benefit Stream	B-C	Growth Factor
		Proj Costs	OM				
1	1991						1.000
2	1992						1.000
3	1993						1.000
4	1994						1.000
5	1995	347.60	0.00	347.60	0.00	(347.60)	1.000
6	1996	347.60	1.16	348.76	37.47	(311.29)	1.000
7	1997	347.60	2.32	349.92	74.94	(274.99)	1.000
8	1998	347.60	3.49	351.09	112.40	(238.68)	1.000
9	1999	347.60	4.65	352.25	149.87	(202.37)	1.000
10	2000	347.60	5.81	353.41	187.34	(166.07)	1.000
11	2001	347.60	6.97	354.57	224.81	(129.76)	1.000
12	2002	347.60	8.13	355.73	262.28	(93.46)	1.000
13	2003	347.60	9.30	356.90	299.75	(57.15)	1.000
14	2004	347.60	10.46	358.06	337.21	(20.84)	1.000
15	2005		11.62	11.62	374.68	363.06	1.000
16	2006		11.62	11.62	374.68	363.06	1.000
17	2007		11.62	11.62	374.68	363.06	1.000
18	2008		11.62	11.62	374.68	363.06	1.000
19	2009		11.62	11.62	374.68	363.06	1.000
20	2010		11.62	11.62	374.68	363.06	1.000
21	2011		11.62	11.62	374.68	363.06	1.000
22	2012		11.62	11.62	374.68	363.06	1.000
23	2013		11.62	11.62	374.68	363.06	1.000
24	2014		11.62	11.62	374.68	363.06	1.000
25	2015		11.62	11.62	374.68	363.06	1.000
26	2016		11.62	11.62	374.68	363.06	1.000
27	2017		11.62	11.62	374.68	363.06	1.000
28	2018		11.62	11.62	374.68	363.06	1.000
29	2019		11.62	11.62	374.68	363.06	1.000
30	2020		11.62	11.62	374.68	363.06	1.000
31	2021		11.62	11.62	374.68	363.06	1.000
32	2022		11.62	11.62	374.68	363.06	1.000
33	2023		11.62	11.62	374.68	363.06	1.000
34	2024		11.62	11.62	374.68	363.06	1.000
35	2025		11.62	11.62	374.68	363.06	1.000
36	2026		11.62	11.62	374.68	363.06	1.000
37	2027		11.62	11.62	374.68	363.06	1.000
38	2028		11.62	11.62	374.68	363.06	1.000
39	2029		11.62	11.62	374.68	363.06	1.000
40	2030		11.62	11.62	374.68	363.06	1.000
41	2031		11.62	11.62	374.68	363.06	1.000
42	2032		11.62	11.62	374.68	363.06	1.000
43	2033		11.62	11.62	374.68	363.06	1.000
44	2034		11.62	11.62	374.68	363.06	1.000
45	2035		11.62	11.62	374.68	363.06	1.000
46	2036		11.62	11.62	374.68	363.06	1.000
47	2037		11.62	11.62	374.68	363.06	1.000
48	2038		11.62	11.62	374.68	363.06	1.000
49	2039		11.62	11.62	374.68	363.06	1.000
50	2040		11.62	11.62	374.68	363.06	1.000
51	2041		11.62	11.62	374.68	363.06	1.000
52	2042		11.62	11.62	374.68	363.06	1.000
53	2043		11.62	11.62	374.68	363.06	1.000
54	2044		11.62	11.62	374.68	363.06	1.000

Table 6.2 COST-BENEFIT ANALYSIS: AGNO RIVER BASIN FLOOD CONTROL PROJECT
CASE A2: UPPER AGNO PROJECT (FUTURE GROWTH CONDITION)

ASSUMPTIONS (1991 Prices)							
PROJECT COSTS		Upper Agno	GROWTH FACTOR				
Main Constr Costs		2,324	2000				1.049
Other Costs		1,152	2010				1.538
Total Costs		3,476	2045				2.482
ANNUAL BENEFITS							
1989 Prices		283	CALCULATED EIRR	20.58%			
1991 Prices		375	CALCULATED NPV	976			
No.	Year	Proj Costs	Cost Stream OM	Total	Benefit Stream	B-G	Growth Factor
1	1991						1.000
2	1992						1.049
3	1993						1.100
4	1994						1.154
5	1995	347.60	0.00	347.60	0.00	(347.60)	1.211
6	1996	347.60	1.16	348.76	47.59	(301.17)	1.270
7	1997	347.60	2.32	349.92	99.85	(250.07)	1.332
8	1998	347.60	3.49	351.09	157.11	(193.97)	1.398
9	1999	347.60	4.65	352.25	219.75	(132.50)	1.466
10	2000	347.60	5.81	353.41	288.15	(65.26)	1.538
11	2001	347.60	6.97	354.57	362.72	8.15	1.613
12	2002	347.60	8.13	355.73	443.91	88.17	1.693
13	2003	347.60	9.30	356.90	532.18	175.29	1.775
14	2004	347.60	10.46	358.06	628.04	269.98	1.862
15	2005		11.62	11.62	732.02	720.40	1.954
16	2006		11.62	11.62	767.89	756.27	2.049
17	2007		11.62	11.62	805.51	793.89	2.150
18	2008		11.62	11.62	844.98	833.36	2.255
19	2009		11.62	11.62	886.39	874.77	2.366
20	2010		11.62	11.62	929.82	918.20	2.482
21	2011		11.62	11.62	975.38	963.76	2.603
22	2012		11.62	11.62	1,023.17	1,011.55	2.731
23	2013		11.62	11.62	1,073.31	1,061.69	2.865
24	2014		11.62	11.62	1,125.90	1,114.28	3.005
25	2015		11.62	11.62	1,181.07	1,169.45	3.152
26	2016		11.62	11.62	1,238.94	1,227.32	3.307
27	2017		11.62	11.62	1,299.65	1,288.03	3.469
28	2018		11.62	11.62	1,363.33	1,351.71	3.639
29	2019		11.62	11.62	1,430.14	1,418.52	3.817
30	2020		11.62	11.62	1,500.21	1,488.59	4.004
31	2021		11.62	11.62	1,573.72	1,562.10	4.200
32	2022		11.62	11.62	1,650.84	1,639.22	4.406
33	2023		11.62	11.62	1,731.73	1,720.11	4.622
34	2024		11.62	11.62	1,816.58	1,804.96	4.848
35	2025		11.62	11.62	1,905.60	1,893.98	5.086
36	2026		11.62	11.62	1,998.97	1,987.35	5.335
37	2027		11.62	11.62	2,096.92	2,085.30	5.597
38	2028		11.62	11.62	2,199.67	2,188.05	5.871
39	2029		11.62	11.62	2,307.45	2,295.83	6.158
40	2030		11.62	11.62	2,420.52	2,408.90	6.460
41	2031		11.62	11.62	2,539.12	2,527.50	6.777
42	2032		11.62	11.62	2,663.54	2,651.92	7.109
43	2033		11.62	11.62	2,794.05	2,782.43	7.457
44	2034		11.62	11.62	2,930.96	2,919.34	7.823
45	2035		11.62	11.62	3,074.58	3,062.96	8.206
46	2036		11.62	11.62	3,225.23	3,213.61	8.608
47	2037		11.62	11.62	3,383.27	3,371.65	9.030
48	2038		11.62	11.62	3,549.05	3,537.43	9.472
49	2039		11.62	11.62	3,722.95	3,711.33	9.936
50	2040		11.62	11.62	3,905.38	3,893.76	10.423
51	2041		11.62	11.62	4,096.74	4,085.12	10.934
52	2042		11.62	11.62	4,297.48	4,285.86	11.470
53	2043		11.62	11.62	4,508.06	4,496.44	12.032
54	2044		11.62	11.62	4,728.95	4,717.33	12.621

Table 6.3 COST-BENEFIT ANALYSIS: AGNO RIVER BASIN FLOOD CONTROL PROJECT
CASE B1: PANTAL-SINOCALAN PROJECT (CONSTANT GROWTH CONDITION)

ASSUMPTIONS (1991 Prices)							
PROJECT COSTS		Panto-Sino	GROWTH FACTOR				
Main Construction Costs		2,246	2000		1.000		
Other Costs		1,061	2010		1.000		
Total Costs		3,307	2045		1.000		
ANNUAL BENEFITS							
1989 Prices		207	CALCULATED EIRR		7.64%		
1991 Prices		274	CALCULATED NPV		(783)		
No.	Year	Cost Stream		Total	Benefit Stream	B-C	Growth Factor
		Proj Costs	OM				
1	1991						1.000
2	1992						1.000
3	1993						1.000
4	1994						1.000
5	1995	330.70	0.00	330.70	0.00	(330.70)	1.000
6	1996	330.70	1.12	331.82	27.37	(304.46)	1.000
7	1997	330.70	2.25	332.95	54.73	(278.21)	1.000
8	1998	330.70	3.37	334.07	82.10	(251.97)	1.000
9	1999	330.70	4.49	335.19	109.47	(225.72)	1.000
10	2000	330.70	5.62	336.32	136.84	(199.48)	1.000
11	2001	330.70	6.74	337.44	164.20	(173.23)	1.000
12	2002	330.70	7.86	338.56	191.57	(146.99)	1.000
13	2003	330.70	8.98	339.68	218.94	(120.74)	1.000
14	2004	330.70	10.11	340.81	246.31	(94.50)	1.000
15	2005		11.23	11.23	273.67	262.44	1.000
16	2006		11.23	11.23	273.67	262.44	1.000
17	2007		11.23	11.23	273.67	262.44	1.000
18	2008		11.23	11.23	273.67	262.44	1.000
19	2009		11.23	11.23	273.67	262.44	1.000
20	2010		11.23	11.23	273.67	262.44	1.000
21	2011		11.23	11.23	273.67	262.44	1.000
22	2012		11.23	11.23	273.67	262.44	1.000
23	2013		11.23	11.23	273.67	262.44	1.000
24	2014		11.23	11.23	273.67	262.44	1.000
25	2015		11.23	11.23	273.67	262.44	1.000
26	2016		11.23	11.23	273.67	262.44	1.000
27	2017		11.23	11.23	273.67	262.44	1.000
28	2018		11.23	11.23	273.67	262.44	1.000
29	2019		11.23	11.23	273.67	262.44	1.000
30	2020		11.23	11.23	273.67	262.44	1.000
31	2021		11.23	11.23	273.67	262.44	1.000
32	2022		11.23	11.23	273.67	262.44	1.000
33	2023		11.23	11.23	273.67	262.44	1.000
34	2024		11.23	11.23	273.67	262.44	1.000
35	2025		11.23	11.23	273.67	262.44	1.000
36	2026		11.23	11.23	273.67	262.44	1.000
37	2027		11.23	11.23	273.67	262.44	1.000
38	2028		11.23	11.23	273.67	262.44	1.000
39	2029		11.23	11.23	273.67	262.44	1.000
40	2030		11.23	11.23	273.67	262.44	1.000
41	2031		11.23	11.23	273.67	262.44	1.000
42	2032		11.23	11.23	273.67	262.44	1.000
43	2033		11.23	11.23	273.67	262.44	1.000
44	2034		11.23	11.23	273.67	262.44	1.000
45	2035		11.23	11.23	273.67	262.44	1.000
46	2036		11.23	11.23	273.67	262.44	1.000
47	2037		11.23	11.23	273.67	262.44	1.000
48	2038		11.23	11.23	273.67	262.44	1.000
49	2039		11.23	11.23	273.67	262.44	1.000
50	2040		11.23	11.23	273.67	262.44	1.000
51	2041		11.23	11.23	273.67	262.44	1.000
52	2042		11.23	11.23	273.67	262.44	1.000
53	2043		11.23	11.23	273.67	262.44	1.000
54	2044		11.23	11.23	273.67	262.44	1.000

Table 6.4 COST-BENEFIT ANALYSIS: AGNO RIVER BASIN FLOOD CONTROL PROJECT
CASE B2: PANTAL-SINOCALAN PROJECT (FUTURE GROWTH CONDITION)

ASSUMPTIONS (1991 Prices)							
PROJECT COSTS		Panto-Sino	GROWTH FACTOR				
Main Construction Costs		2,246	2000				1.049
Other Costs		1,061	2010				1.538
Total Costs		3,307	2045				2.482
ANNUAL BENEFITS							
1989 Prices		207	CALCULATED EIRR		16.96%		
1991 Prices		274	CALCULATED NPV		318		
No.	Year	Cost Stream		Total	Benefit Stream	B-C	Growth Factor
		Proj Costs	OM				
1	1991						1.000
2	1992						1.049
3	1993						1.100
4	1994						1.154
5	1995	330.70	0.00	330.70	0.00	(330.70)	1.211
6	1996	330.70	1.12	331.82	34.76	(297.06)	1.270
7	1997	330.70	2.25	332.95	72.93	(260.01)	1.332
8	1998	330.70	3.37	334.07	114.76	(219.31)	1.398
9	1999	330.70	4.49	335.19	160.51	(174.68)	1.466
10	2000	330.70	5.62	336.32	210.47	(125.85)	1.538
11	2001	330.70	6.74	337.44	264.94	(72.50)	1.613
12	2002	330.70	7.86	338.56	324.24	(14.32)	1.693
13	2003	330.70	8.98	339.68	388.71	49.03	1.775
14	2004	330.70	10.11	340.81	458.73	117.92	1.862
15	2005		11.23	11.23	534.68	523.45	1.954
16	2006		11.23	11.23	560.88	549.65	2.049
17	2007		11.23	11.23	588.36	577.13	2.150
18	2008		11.23	11.23	617.19	605.96	2.255
19	2009		11.23	11.23	647.43	636.20	2.366
20	2010		11.23	11.23	679.16	667.93	2.482
21	2011		11.23	11.23	712.43	701.20	2.603
22	2012		11.23	11.23	747.34	736.11	2.731
23	2013		11.23	11.23	783.96	772.73	2.865
24	2014		11.23	11.23	822.38	811.15	3.005
25	2015		11.23	11.23	862.67	851.44	3.152
26	2016		11.23	11.23	904.94	893.71	3.307
27	2017		11.23	11.23	949.29	938.06	3.469
28	2018		11.23	11.23	995.80	984.57	3.639
29	2019		11.23	11.23	1,044.60	1,033.37	3.817
30	2020		11.23	11.23	1,095.78	1,084.55	4.004
31	2021		11.23	11.23	1,149.47	1,138.24	4.200
32	2022		11.23	11.23	1,205.80	1,194.57	4.406
33	2023		11.23	11.23	1,264.88	1,253.65	4.622
34	2024		11.23	11.23	1,326.86	1,315.63	4.848
35	2025		11.23	11.23	1,391.88	1,380.65	5.086
36	2026		11.23	11.23	1,460.08	1,448.85	5.335
37	2027		11.23	11.23	1,531.62	1,520.39	5.597
38	2028		11.23	11.23	1,606.67	1,595.44	5.871
39	2029		11.23	11.23	1,685.40	1,674.17	6.158
40	2030		11.23	11.23	1,767.99	1,756.76	6.460
41	2031		11.23	11.23	1,854.62	1,843.39	6.777
42	2032		11.23	11.23	1,945.49	1,934.26	7.109
43	2033		11.23	11.23	2,040.82	2,029.59	7.457
44	2034		11.23	11.23	2,140.82	2,129.59	7.823
45	2035		11.23	11.23	2,245.72	2,234.49	8.206
46	2036		11.23	11.23	2,355.76	2,344.53	8.608
47	2037		11.23	11.23	2,471.20	2,459.97	9.030
48	2038		11.23	11.23	2,592.28	2,581.05	9.472
49	2039		11.23	11.23	2,719.31	2,708.08	9.936
50	2040		11.23	11.23	2,852.55	2,841.32	10.423
51	2041		11.23	11.23	2,992.33	2,981.10	10.934
52	2042		11.23	11.23	3,138.95	3,127.72	11.470
53	2043		11.23	11.23	3,292.76	3,281.53	12.032
54	2044		11.23	11.23	3,454.10	3,442.87	12.621

Table 6.5 COST-BENEFIT ANALYSIS: AGNO RIVER BASIN FLOOD CONTROL PROJECT
CASE C1: SIMULTANEOUS IMPLEMENTATION (CONSTANT GROWTH CONDITION)

ASSUMPTIONS (1991 Prices)							
PROJECT COSTS		Upper Agno	Panto-Sino	GROWTH FACTOR			
Main Constr Costs		2,324	2,246	2000		1.000	
Other Costs		1,152	1,061	2010		1.000	
Total Costs		3,476	3,307	2045		1.000	
ANNUAL BENEFITS							
1989 Prices		283	207	CALCULATED EIRR		9.03%	
1991 Prices		375	274	CALCULATED NPV		(1,315)	
No.	Year	Cost Stream		Total	Benefit Stream	B-C	Growth Factor
		Proj Costs	OM				
1	1991						1.000
2	1992						1.000
3	1993						1.000
4	1994						1.000
5	1995	678.30	0.00	678.30	0.00	(678.30)	1.000
6	1996	678.30	2.29	680.58	64.84	(615.75)	1.000
7	1997	678.30	4.57	682.87	129.67	(553.20)	1.000
8	1998	678.30	6.86	685.16	194.51	(490.65)	1.000
9	1999	678.30	9.14	687.44	259.34	(428.10)	1.000
10	2000	678.30	11.43	689.72	324.18	(365.55)	1.000
11	2001	678.30	13.71	692.01	389.01	(303.00)	1.000
12	2002	678.30	16.00	694.30	453.85	(240.44)	1.000
13	2003	678.30	18.28	696.58	518.69	(177.89)	1.000
14	2004	678.30	20.57	698.87	583.52	(115.34)	1.000
15	2005		22.85	22.85	648.36	625.51	1.000
16	2006		22.85	22.85	648.36	625.51	1.000
17	2007		22.85	22.85	648.36	625.51	1.000
18	2008		22.85	22.85	648.36	625.51	1.000
19	2009		22.85	22.85	648.36	625.51	1.000
20	2010		22.85	22.85	648.36	625.51	1.000
21	2011		22.85	22.85	648.36	625.51	1.000
22	2012		22.85	22.85	648.36	625.51	1.000
23	2013		22.85	22.85	648.36	625.51	1.000
24	2014		22.85	22.85	648.36	625.51	1.000
25	2015		22.85	22.85	648.36	625.51	1.000
26	2016		22.85	22.85	648.36	625.51	1.000
27	2017		22.85	22.85	648.36	625.51	1.000
28	2018		22.85	22.85	648.36	625.51	1.000
29	2019		22.85	22.85	648.36	625.51	1.000
30	2020		22.85	22.85	648.36	625.51	1.000
31	2021		22.85	22.85	648.36	625.51	1.000
32	2022		22.85	22.85	648.36	625.51	1.000
33	2023		22.85	22.85	648.36	625.51	1.000
34	2024		22.85	22.85	648.36	625.51	1.000
35	2025		22.85	22.85	648.36	625.51	1.000
36	2026		22.85	22.85	648.36	625.51	1.000
37	2027		22.85	22.85	648.36	625.51	1.000
38	2028		22.85	22.85	648.36	625.51	1.000
39	2029		22.85	22.85	648.36	625.51	1.000
40	2030		22.85	22.85	648.36	625.51	1.000
41	2031		22.85	22.85	648.36	625.51	1.000
42	2032		22.85	22.85	648.36	625.51	1.000
43	2033		22.85	22.85	648.36	625.51	1.000
44	2034		22.85	22.85	648.36	625.51	1.000
45	2035		22.85	22.85	648.36	625.51	1.000
46	2036		22.85	22.85	648.36	625.51	1.000
47	2037		22.85	22.85	648.36	625.51	1.000
48	2038		22.85	22.85	648.36	625.51	1.000
49	2039		22.85	22.85	648.36	625.51	1.000
50	2040		22.85	22.85	648.36	625.51	1.000
51	2041		22.85	22.85	648.36	625.51	1.000
52	2042		22.85	22.85	648.36	625.51	1.000
53	2043		22.85	22.85	648.36	625.51	1.000
54	2044		22.85	22.85	648.36	625.51	1.000

Table 6.6 COST-BENEFIT ANALYSIS: AGNO RIVER BASIN FLOOD CONTROL PROJECT
CASE C2: SIMULTANEOUS IMPLEMENTATION (FUTURE GROWTH CONDITION)

ASSUMPTIONS (1991 Prices)							
PROJECT COSTS		Upper Agno	Panto-Sino	GROWTH FACTOR			
Main Constr Costs		2,324	2,246	2000		1.049	
Other Costs		1,152	1,061	2010		1.538	
Total Costs		3,476	3,307	2045		2.482	
ANNUAL BENEFITS							
1989 Prices		283	207	CALCULATED EIRR		18.83%	
1991 Prices		375	274	CALCULATED NPV		1,295	
No.	Year	Proj Costs	Cost Stream OM	Total	Benefit Stream	B-C	Growth Factor
1	1991						1.000
2	1992						1.049
3	1993						1.100
4	1994						1.154
5	1995	678.30	0.00	678.30	0.00	(678.30)	1.211
6	1996	678.30	2.29	680.58	82.36	(598.23)	1.270
7	1997	678.30	4.57	682.87	172.78	(510.09)	1.332
8	1998	678.30	6.86	685.16	271.87	(413.28)	1.398
9	1999	678.30	9.14	687.44	380.26	(307.18)	1.466
10	2000	678.30	11.43	689.72	498.61	(191.11)	1.538
11	2001	678.30	13.71	692.01	627.65	(64.36)	1.613
12	2002	678.30	16.00	694.30	768.14	73.85	1.693
13	2003	678.30	18.28	696.58	920.90	224.32	1.775
14	2004	678.30	20.57	698.87	1,086.77	387.91	1.862
15	2005		22.85	22.85	1,266.69	1,243.84	1.954
16	2006		22.85	22.85	1,328.76	1,305.91	2.049
17	2007		22.85	22.85	1,393.87	1,371.02	2.150
18	2008		22.85	22.85	1,462.17	1,439.32	2.255
19	2009		22.85	22.85	1,533.82	1,510.97	2.366
20	2010		22.85	22.85	1,608.97	1,586.12	2.482
21	2011		22.85	22.85	1,687.81	1,664.96	2.603
22	2012		22.85	22.85	1,770.52	1,747.67	2.731
23	2013		22.85	22.85	1,857.27	1,834.42	2.865
24	2014		22.85	22.85	1,948.28	1,925.43	3.005
25	2015		22.85	22.85	2,043.74	2,020.89	3.152
26	2016		22.85	22.85	2,143.89	2,121.04	3.307
27	2017		22.85	22.85	2,248.94	2,226.09	3.469
28	2018		22.85	22.85	2,359.14	2,336.29	3.639
29	2019		22.85	22.85	2,474.73	2,451.88	3.817
30	2020		22.85	22.85	2,596.00	2,573.15	4.004
31	2021		22.85	22.85	2,723.20	2,700.35	4.200
32	2022		22.85	22.85	2,856.64	2,833.79	4.406
33	2023		22.85	22.85	2,996.61	2,973.76	4.622
34	2024		22.85	22.85	3,143.45	3,120.60	4.848
35	2025		22.85	22.85	3,297.47	3,274.62	5.086
36	2026		22.85	22.85	3,459.05	3,436.20	5.335
37	2027		22.85	22.85	3,628.54	3,605.69	5.597
38	2028		22.85	22.85	3,806.34	3,783.49	5.871
39	2029		22.85	22.85	3,992.85	3,970.00	6.158
40	2030		22.85	22.85	4,188.50	4,165.65	6.460
41	2031		22.85	22.85	4,393.74	4,370.89	6.777
42	2032		22.85	22.85	4,609.03	4,586.18	7.109
43	2033		22.85	22.85	4,834.88	4,812.03	7.457
44	2034		22.85	22.85	5,071.78	5,048.93	7.823
45	2035		22.85	22.85	5,320.30	5,297.45	8.206
46	2036		22.85	22.85	5,581.00	5,558.15	8.608
47	2037		22.85	22.85	5,854.47	5,831.62	9.030
48	2038		22.85	22.85	6,141.33	6,118.48	9.472
49	2039		22.85	22.85	6,442.26	6,419.41	9.936
50	2040		22.85	22.85	6,757.93	6,735.08	10.423
51	2041		22.85	22.85	7,089.07	7,066.22	10.934
52	2042		22.85	22.85	7,436.43	7,413.58	11.470
53	2043		22.85	22.85	7,800.82	7,777.97	12.032
54	2044		22.85	22.85	8,183.06	8,160.21	12.621

Table 6.7 COST-BENEFIT ANALYSIS: AGNO RIVER BASIN FLOOD CONTROL PROJECT
CASE D1: STEPWISE IMPLEMENTATION (CONSTANT GROWTH CONDITION)

ASSUMPTIONS (1991 Prices)							
PROJECT COSTS		Upper Agno	Panto-Sino	GROWTH FACTOR		1	
Main Constr Costs		2,324	2,246	2000		1.000	
Other Costs		1,152	1,061	2010		1.000	
Total Costs		3,476	3,307	2045		1.000	
ANNUAL BENEFITS							
1989 Prices		283	207	CALCULATED EIRR		9.29%	
1991 Prices		375	274	CALCULATED NPV		(922)	
No.	Year	Proj Costs	Cost Stream OM	Total	Benefit Stream	B-C	Growth Factor
1	1991						1.000
2	1992						1.000
3	1993						1.000
4	1994						1.000
5	1995	347.60	0.00	347.60	0.00	(347.60)	1.000
6	1996	347.60	1.16	348.76	37.47	(311.29)	1.000
7	1997	347.60	2.32	349.92	74.94	(274.99)	1.000
8	1998	347.60	3.49	351.09	112.40	(238.68)	1.000
9	1999	347.60	4.65	352.25	149.87	(202.37)	1.000
10	2000	678.30	5.81	684.11	187.34	(496.77)	1.000
11	2001	678.30	8.10	686.40	252.18	(434.22)	1.000
12	2002	678.30	10.38	688.68	317.01	(371.67)	1.000
13	2003	678.30	12.67	690.96	381.85	(309.12)	1.000
14	2004	678.30	14.95	693.25	446.68	(246.57)	1.000
15	2005	330.70	17.24	347.94	511.52	163.59	1.000
16	2006	330.70	18.36	349.06	538.89	189.83	1.000
17	2007	330.70	19.48	350.18	566.26	216.07	1.000
18	2008	330.70	20.60	351.30	593.62	242.32	1.000
19	2009	330.70	21.73	352.43	620.99	268.56	1.000
20	2010		22.85	22.85	648.36	625.51	1.000
21	2011		22.85	22.85	648.36	625.51	1.000
22	2012		22.85	22.85	648.36	625.51	1.000
23	2013		22.85	22.85	648.36	625.51	1.000
24	2014		22.85	22.85	648.36	625.51	1.000
25	2015		22.85	22.85	648.36	625.51	1.000
26	2016		22.85	22.85	648.36	625.51	1.000
27	2017		22.85	22.85	648.36	625.51	1.000
28	2018		22.85	22.85	648.36	625.51	1.000
29	2019		22.85	22.85	648.36	625.51	1.000
30	2020		22.85	22.85	648.36	625.51	1.000
31	2021		22.85	22.85	648.36	625.51	1.000
32	2022		22.85	22.85	648.36	625.51	1.000
33	2023		22.85	22.85	648.36	625.51	1.000
34	2024		22.85	22.85	648.36	625.51	1.000
35	2025		22.85	22.85	648.36	625.51	1.000
36	2026		22.85	22.85	648.36	625.51	1.000
37	2027		22.85	22.85	648.36	625.51	1.000
38	2028		22.85	22.85	648.36	625.51	1.000
39	2029		22.85	22.85	648.36	625.51	1.000
40	2030		22.85	22.85	648.36	625.51	1.000
41	2031		22.85	22.85	648.36	625.51	1.000
42	2032		22.85	22.85	648.36	625.51	1.000
43	2033		22.85	22.85	648.36	625.51	1.000
44	2034		22.85	22.85	648.36	625.51	1.000
45	2035		22.85	22.85	648.36	625.51	1.000
46	2036		22.85	22.85	648.36	625.51	1.000
47	2037		22.85	22.85	648.36	625.51	1.000
48	2038		22.85	22.85	648.36	625.51	1.000
49	2039		22.85	22.85	648.36	625.51	1.000
50	2040		22.85	22.85	648.36	625.51	1.000
51	2041		22.85	22.85	648.36	625.51	1.000
52	2042		22.85	22.85	648.36	625.51	1.000
53	2043		22.85	22.85	648.36	625.51	1.000
54	2044		22.85	22.85	648.36	625.51	1.000

Table 6.8 COST-BENEFIT ANALYSIS: AGNO RIVER BASIN FLOOD CONTROL PROJECT
CASE D2: STEPWISE IMPLEMENTATION (FUTURE GROWTH CONDITION)

ASSUMPTIONS (1991 Prices)							
PROJECT COSTS		Upper Agno	Panto-Sino	GROWTH FACTOR			
Main Constr Costs		2,324	2,246	2000			1.049
Other Costs		1,152	1,061	2010			1.538
Total Costs		3,476	3,307	2045			2.482
ANNUAL BENEFITS				CALCULATED EIRR			
1989 Prices		283	207				20.47%
1991 Prices		375	274				CALCULATED NPV
							1,393
No.	Year	Cost Stream		Total	Benefit Stream	B-C	Growth Factor
		Proj Costs	OM				
1	1991						1.000
2	1992						1.049
3	1993						1.100
4	1994						1.154
5	1995	347.60	0.00	347.60	0.00	(347.60)	1.211
6	1996	347.60	1.16	348.76	47.59	(301.17)	1.270
7	1997	347.60	2.32	349.92	99.85	(250.07)	1.332
8	1998	347.60	3.49	351.09	157.11	(193.97)	1.398
9	1999	347.60	4.65	352.25	219.75	(132.50)	1.466
10	2000	678.30	5.81	684.11	288.15	(395.96)	1.538
11	2001	678.30	8.10	686.40	406.87	(279.52)	1.613
12	2002	678.30	10.38	688.68	536.55	(152.13)	1.693
13	2003	678.30	12.67	690.96	677.95	(13.02)	1.775
14	2004	678.30	14.95	693.25	831.92	138.67	1.862
15	2005	330.70	17.24	347.94	999.36	651.42	1.954
16	2006	330.70	18.36	349.06	1,104.41	755.35	2.049
17	2007	330.70	19.48	350.18	1,217.36	867.18	2.150
18	2008	330.70	20.60	351.30	1,338.73	987.43	2.255
19	2009	330.70	21.73	352.43	1,469.07	1,116.65	2.366
20	2010		22.85	22.85	1,608.97	1,586.12	2.482
21	2011		22.85	22.85	1,687.81	1,664.96	2.603
22	2012		22.85	22.85	1,770.52	1,747.67	2.731
23	2013		22.85	22.85	1,857.27	1,834.42	2.865
24	2014		22.85	22.85	1,948.28	1,925.43	3.005
25	2015		22.85	22.85	2,043.74	2,020.89	3.152
26	2016		22.85	22.85	2,143.89	2,121.04	3.307
27	2017		22.85	22.85	2,248.94	2,226.09	3.469
28	2018		22.85	22.85	2,359.14	2,336.29	3.639
29	2019		22.85	22.85	2,474.73	2,451.88	3.817
30	2020		22.85	22.85	2,596.00	2,573.15	4.004
31	2021		22.85	22.85	2,723.20	2,700.35	4.200
32	2022		22.85	22.85	2,856.64	2,833.79	4.406
33	2023		22.85	22.85	2,996.61	2,973.76	4.622
34	2024		22.85	22.85	3,143.45	3,120.60	4.848
35	2025		22.85	22.85	3,297.47	3,274.62	5.086
36	2026		22.85	22.85	3,459.05	3,436.20	5.335
37	2027		22.85	22.85	3,628.54	3,605.69	5.597
38	2028		22.85	22.85	3,806.34	3,783.49	5.871
39	2029		22.85	22.85	3,992.85	3,970.00	6.158
40	2030		22.85	22.85	4,188.50	4,165.65	6.460
41	2031		22.85	22.85	4,393.74	4,370.89	6.777
42	2032		22.85	22.85	4,609.03	4,586.18	7.109
43	2033		22.85	22.85	4,834.88	4,812.03	7.457
44	2034		22.85	22.85	5,071.78	5,048.93	7.823
45	2035		22.85	22.85	5,320.30	5,297.45	8.206
46	2036		22.85	22.85	5,581.00	5,558.15	8.608
47	2037		22.85	22.85	5,854.47	5,831.62	9.030
48	2038		22.85	22.85	6,141.33	6,118.48	9.472
49	2039		22.85	22.85	6,442.26	6,419.41	9.936
50	2040		22.85	22.85	6,757.93	6,735.08	10.423
51	2041		22.85	22.85	7,089.07	7,066.22	10.934
52	2042		22.85	22.85	7,436.43	7,413.58	11.470
53	2043		22.85	22.85	7,800.82	7,777.97	12.032
54	2044		22.85	22.85	8,183.06	8,160.21	12.621

Table 6.9 SENSITIVITY ANALYSIS
CASE D2: STEPWISE IMPLEMENTATION (FUTURE GROWTH CONDITION)

Year	CALCULATED EIRR CALCULATED NPV			19.07% 1,130	CALCULATED EIRR CALCULATED NPV			18.10% 710
	10% Increase in Costs			B-C	Reduction in Growth Factor to 3.9%			
	Costs	Benefits			Costs	Benefits	B-C	
1991								
1992								
1993								
1994								
1995	382.36	0.00	(382.36)	347.60	0.00	(347.60)		
1996	383.64	47.59	(336.05)	348.76	45.37	(303.39)		
1997	384.92	99.85	(285.07)	349.92	94.27	(255.65)		
1998	386.19	157.11	(229.08)	351.09	146.92	(204.16)		
1999	387.47	219.75	(167.72)	352.25	203.54	(148.71)		
2000	752.52	288.15	(464.37)	684.11	264.35	(419.76)		
2001	755.03	406.87	(348.16)	686.40	369.71	(316.68)		
2002	757.55	536.55	(221.00)	688.68	482.89	(205.79)		
2003	760.06	677.95	(82.11)	690.96	604.34	(86.63)		
2004	762.58	831.92	69.35	693.25	734.52	41.27		
2005	382.73	999.36	616.63	347.94	873.94	526.00		
2006	383.96	1,104.41	720.45	349.06	956.60	607.54		
2007	385.20	1,217.36	832.16	350.18	1,044.39	694.21		
2008	386.43	1,338.73	952.30	351.30	1,137.56	786.26		
2009	387.67	1,469.07	1,081.40	352.43	1,236.42	883.99		
2010	25.14	1,608.97	1,583.84	22.85	1,341.25	1,318.40		
2011	25.14	1,687.81	1,662.68	22.85	1,393.56	1,370.71		
2012	25.14	1,770.52	1,745.38	22.85	1,447.91	1,425.06		
2013	25.14	1,857.27	1,832.14	22.85	1,504.38	1,481.53		
2014	25.14	1,948.28	1,923.14	22.85	1,563.05	1,540.20		
2015	25.14	2,043.74	2,018.61	22.85	1,624.01	1,601.16		
2016	25.14	2,143.89	2,118.75	22.85	1,687.34	1,664.49		
2017	25.14	2,248.94	2,223.80	22.85	1,753.15	1,730.30		
2018	25.14	2,359.14	2,334.00	22.85	1,821.52	1,798.67		
2019	25.14	2,474.73	2,449.60	22.85	1,892.56	1,869.71		
2020	25.14	2,596.00	2,570.86	22.85	1,966.37	1,943.52		
2021	25.14	2,723.20	2,698.06	22.85	2,043.06	2,020.21		
2022	25.14	2,856.64	2,831.50	22.85	2,122.74	2,099.89		
2023	25.14	2,996.61	2,971.48	22.85	2,205.53	2,182.68		
2024	25.14	3,143.45	3,118.31	22.85	2,291.54	2,268.69		
2025	25.14	3,297.47	3,272.34	22.85	2,380.91	2,358.06		
2026	25.14	3,459.05	3,433.92	22.85	2,473.77	2,450.92		
2027	25.14	3,628.54	3,603.41	22.85	2,570.24	2,547.39		
2028	25.14	3,806.34	3,781.21	22.85	2,670.48	2,647.63		
2029	25.14	3,992.85	3,967.72	22.85	2,774.63	2,751.78		
2030	25.14	4,188.50	4,163.37	22.85	2,882.84	2,859.99		
2031	25.14	4,393.74	4,368.60	22.85	2,995.27	2,972.42		
2032	25.14	4,609.03	4,583.90	22.85	3,112.09	3,089.24		
2033	25.14	4,834.88	4,809.74	22.85	3,233.46	3,210.61		
2034	25.14	5,071.78	5,046.65	22.85	3,359.57	3,336.72		
2035	25.14	5,320.30	5,295.17	22.85	3,490.59	3,467.74		
2036	25.14	5,581.00	5,555.86	22.85	3,626.72	3,603.87		
2037	25.14	5,854.47	5,829.33	22.85	3,768.17	3,745.32		
2038	25.14	6,141.33	6,116.20	22.85	3,915.12	3,892.27		
2039	25.14	6,442.26	6,417.12	22.85	4,067.81	4,044.96		
2040	25.14	6,757.93	6,732.79	22.85	4,226.46	4,203.61		
2041	25.14	7,089.07	7,063.93	22.85	4,391.29	4,368.44		
2042	25.14	7,436.43	7,411.30	22.85	4,562.55	4,539.70		
2043	25.14	7,800.82	7,775.68	22.85	4,740.49	4,717.64		
2044	25.14	8,183.06	8,157.92	22.85	4,925.37	4,902.52		

Table 7.1 ESTIMATE OF AFFECTED POPULATION AND PROPERTIES

Item	UPPER AGNO		PANTAL-SINOCALAN		Affected by Right-of-Way Inundation	Affected by Poponto by Right-of-Way Inundation	TOTAL AFFECTED BY ALL PROJECT COMPONENTS
	Agno R. Stretches	Poponto Right-of-Way	Pantal-Sinocalan	Dagupan R. Stretches			
Population (no)	2,244	3,276	11,358	2,886	3,024	22,788	68,340
Buildings/ Houses (no)	374	546	1,893	481	504	3,798	11,390
Urban Commercial Area (ha)			12			12	
Commercial/ Residential Area (ha)	87	2	109	22	50	270	550
Farmland (ha)	587	163	225	43	71	1,089	18,810
Fish Pond (ha)	1		32	79		112	640
Other Land (ha)	366		154	1		522	522
National Road (km)						0	9
Provincial Road (km)						0	8
Municipal Road (km)						0	11
Barangay Road (km)						0	25
Railway (km)						0	23
Bridge (lm)						0	83

Table 7.2 REALLOCATION OF PROBABLE DIRECT DAMAGES
BETWEEN FARM AND NON-FARM SECTORS

	Return Period (Year)						
	1.05	2	5	10	25	50	100
UPPER AGNO PROJECT							
Farm Sector							
100% of Agricultural Damages	32.0	83.0	192.0	294.0	317.0	393.0	428.0
70% of Residences	32.2	71.4	175.0	275.8	357.0	420.7	472.5
50% of Roads/Bridges	0.0	3.5	19.5	44.0	59.5	80.5	94.5
100% of Irrigation Facility	0.0	1.0	9.0	16.0	19.0	26.0	31.0
70% of Water Supply Facility	0.0	2.1	17.5	38.5	58.8	70.0	82.6
Sub-Total	64.2	161.0	413.0	668.3	811.3	990.2	1,108.6
% of Total	70.5%	72.2%	71.5%	71.1%	68.1%	67.8%	67.2%
Non-Farm Sector							
30% of Residences	13.8	30.6	75.0	118.2	153.0	180.3	202.5
100% of Buildings	12.0	27.0	62.0	91.0	139.0	176.0	205.0
50% of Roads/Bridges	0.0	3.5	19.5	44.0	59.5	80.5	94.5
30% of Water Supply Facility	0.0	0.9	7.5	16.5	25.2	30.0	35.4
100% of Telecommunications	1.0	0.0	1.0	2.0	3.0	4.0	4.0
Sub-Total	26.8	62.0	165.0	271.7	379.7	470.8	541.4
% of Total	29.5%	27.8%	28.5%	28.9%	31.9%	32.2%	32.8%
Total	91.0	223.0	578.0	940.0	1,191.0	1,461.0	1,650.0
PANTAL-SINOCALAN PROJECT							
Farm Sector							
100% of Agricultural Damages	0.0	161.0	243.0	279.0	284.0	354.0	362.0
65% of Residences	0.0	129.4	164.5	185.3	219.7	255.5	289.9
50% of Roads/Bridges	0.0	17.0	26.5	40.0	53.5	71.5	80.5
100% of Irrigation Facility	0.0	5.0	10.0	13.0	17.0	22.0	26.0
65% of Water Supply Facility	0.0	8.5	25.4	33.8	50.7	59.8	68.3
Sub-Total	0.0	320.8	469.3	551.1	624.9	762.8	826.7
% of Total	0.0	72.9%	72.6%	71.8%	68.7%	68.8%	67.2%
Non-Farm Sector							
35% of Residences	0.0	69.6	88.6	99.8	118.3	137.5	156.1
100% of Buildings	0.0	27.0	46.0	57.0	82.0	102.0	127.0
50% of Roads/Bridges	0.0	17.0	26.5	40.0	53.5	71.5	80.5
35% of Water Supply Facility	0.0	4.6	13.6	18.2	27.3	32.2	36.8
100% of Telecommunications	0.0	1.0	2.0	2.0	3.0	3.0	4.0
Sub-Total	0.0	119.2	176.7	217.0	284.1	346.3	404.4
% of Total	0.0	27.1%	27.4%	28.2%	31.3%	31.2%	32.8%
Total	0.0	440.0	646.0	768.0	909.0	1,109.0	1,231.0

Source of Basic Data : Flood Damage Analysis Report, 1991

Notes: Railway facility not allocated

FIGURES

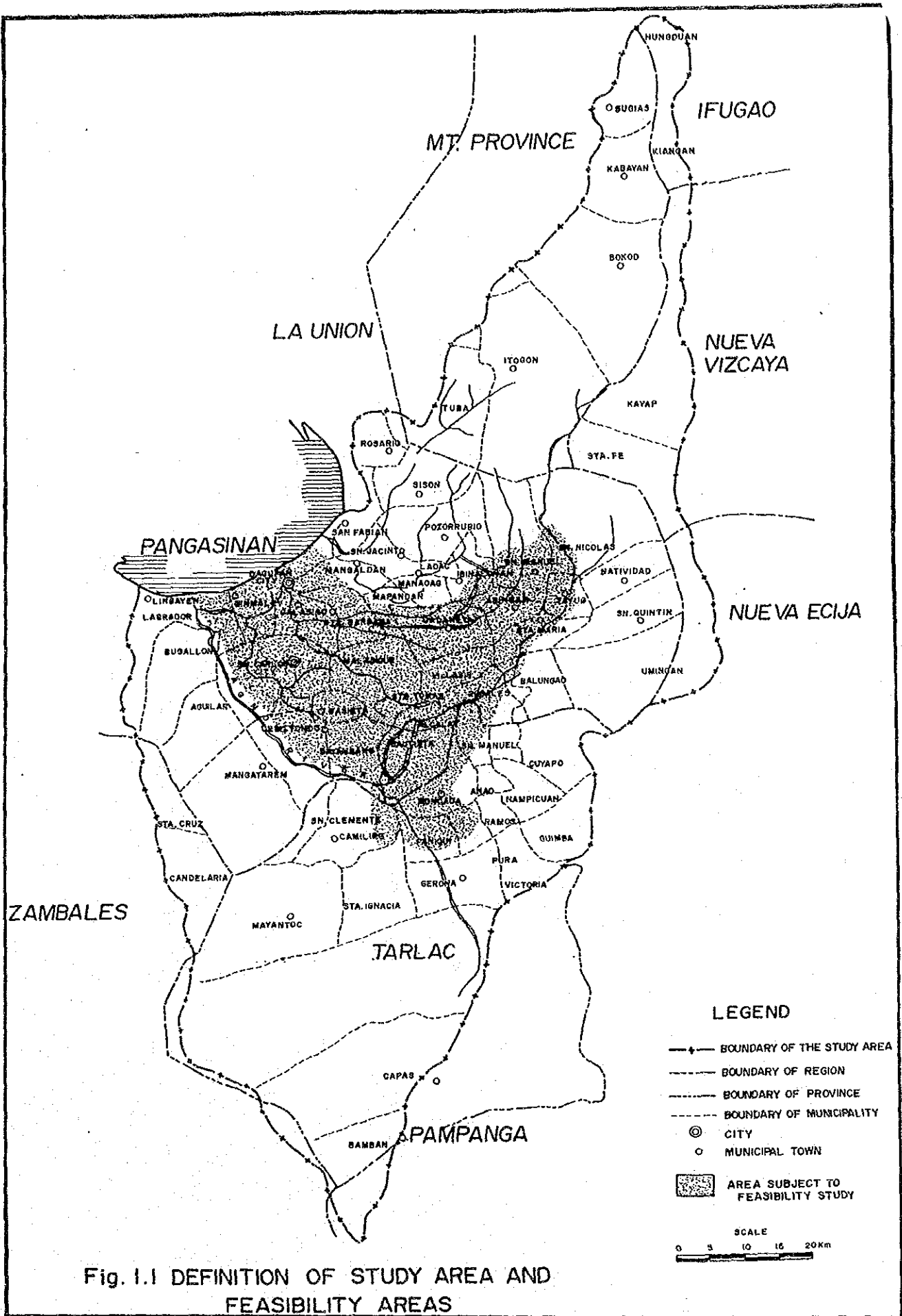


Fig. 1.1 DEFINITION OF STUDY AREA AND FEASIBILITY AREAS

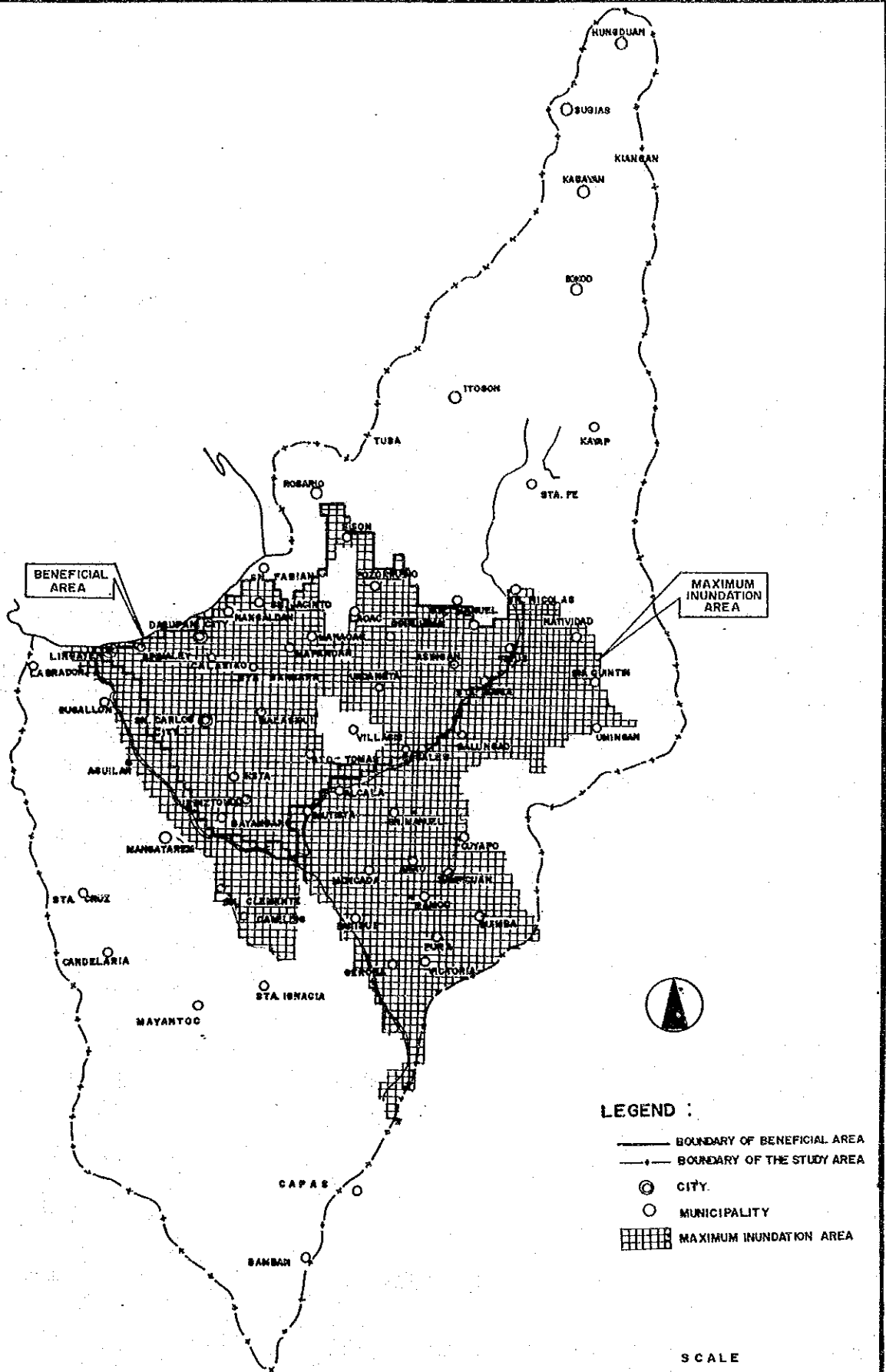
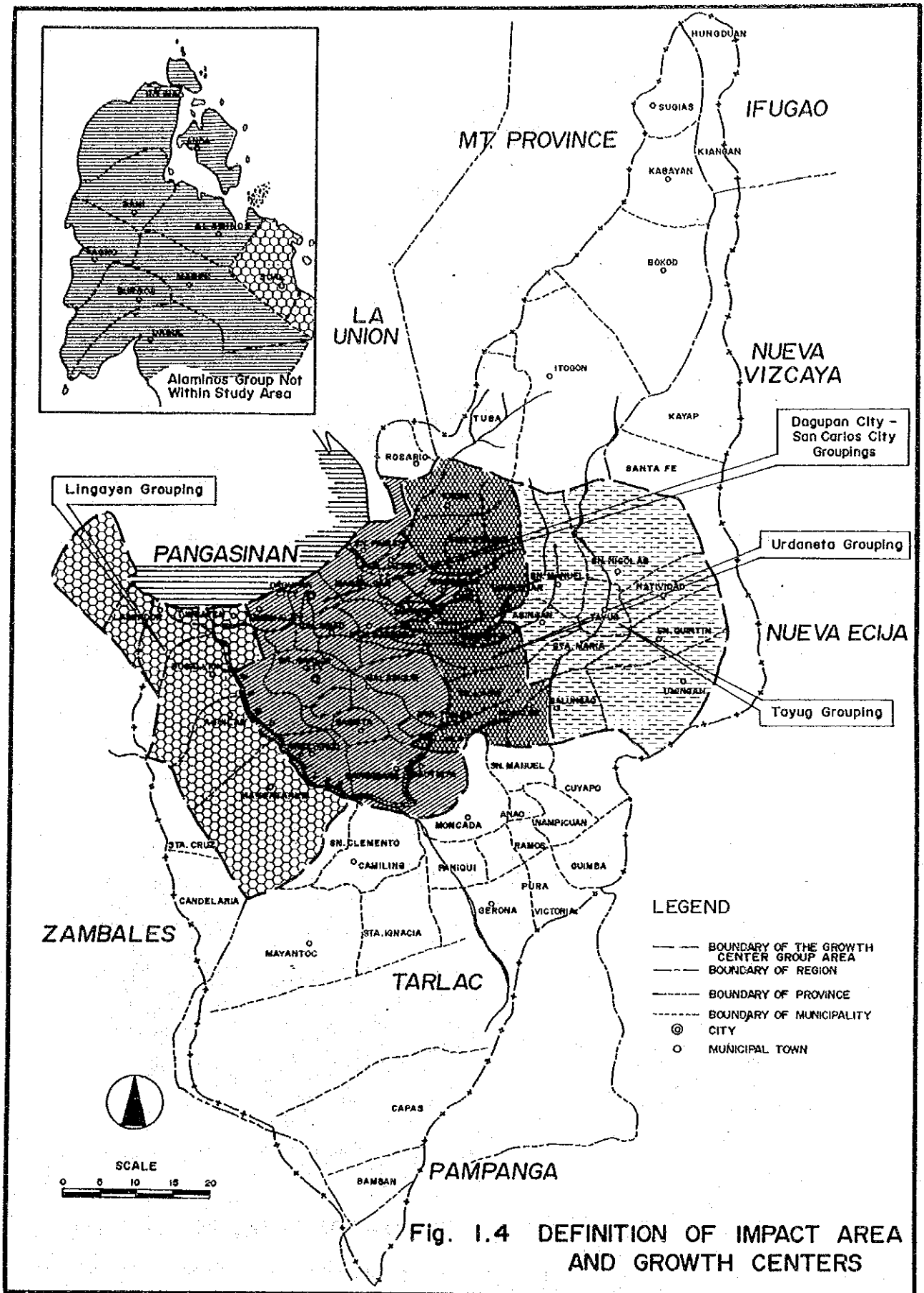


Fig. 1.3 DEFINITION OF BENEFICIAL AREA AND MAXIMUM INUNDATION AREA



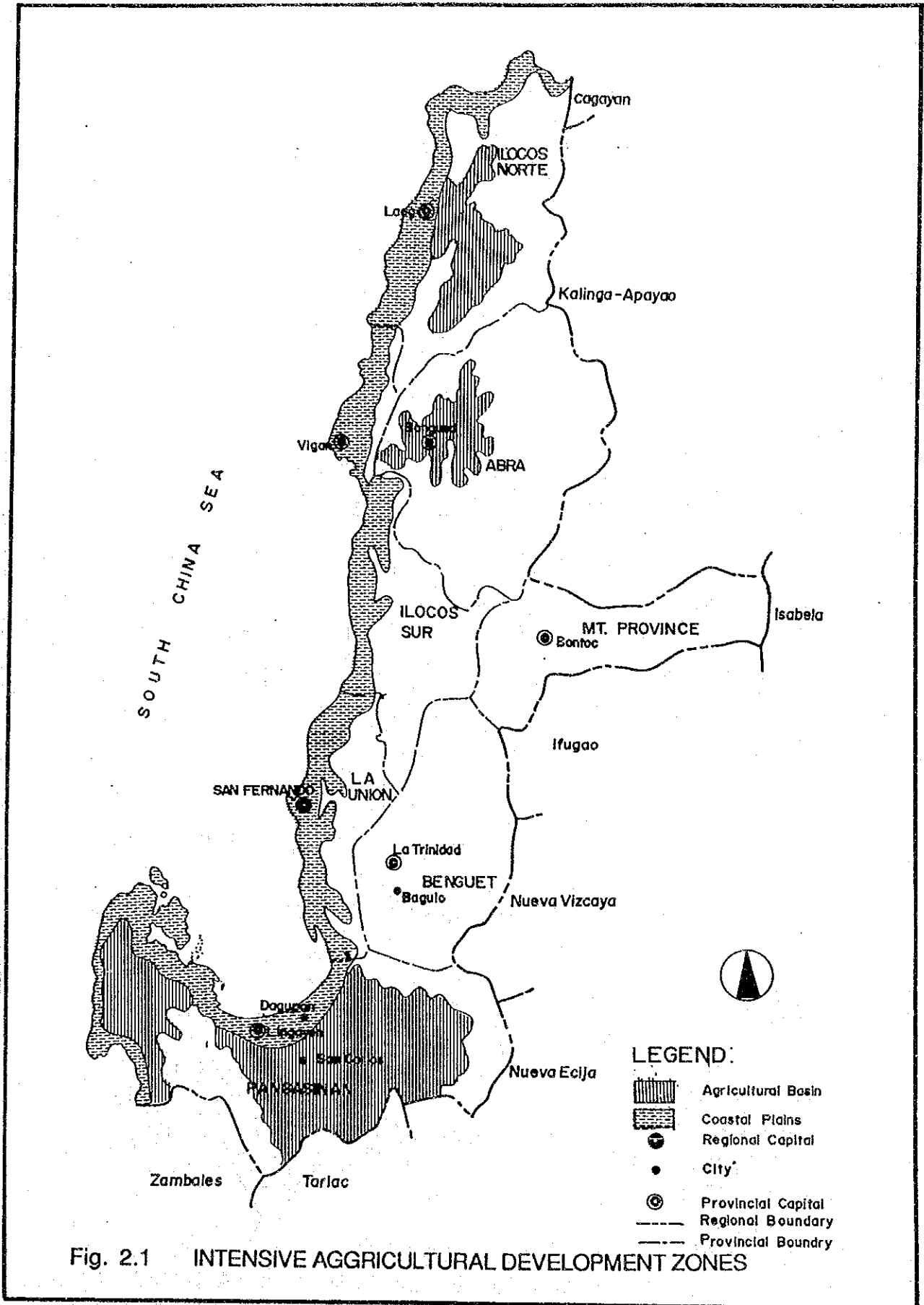
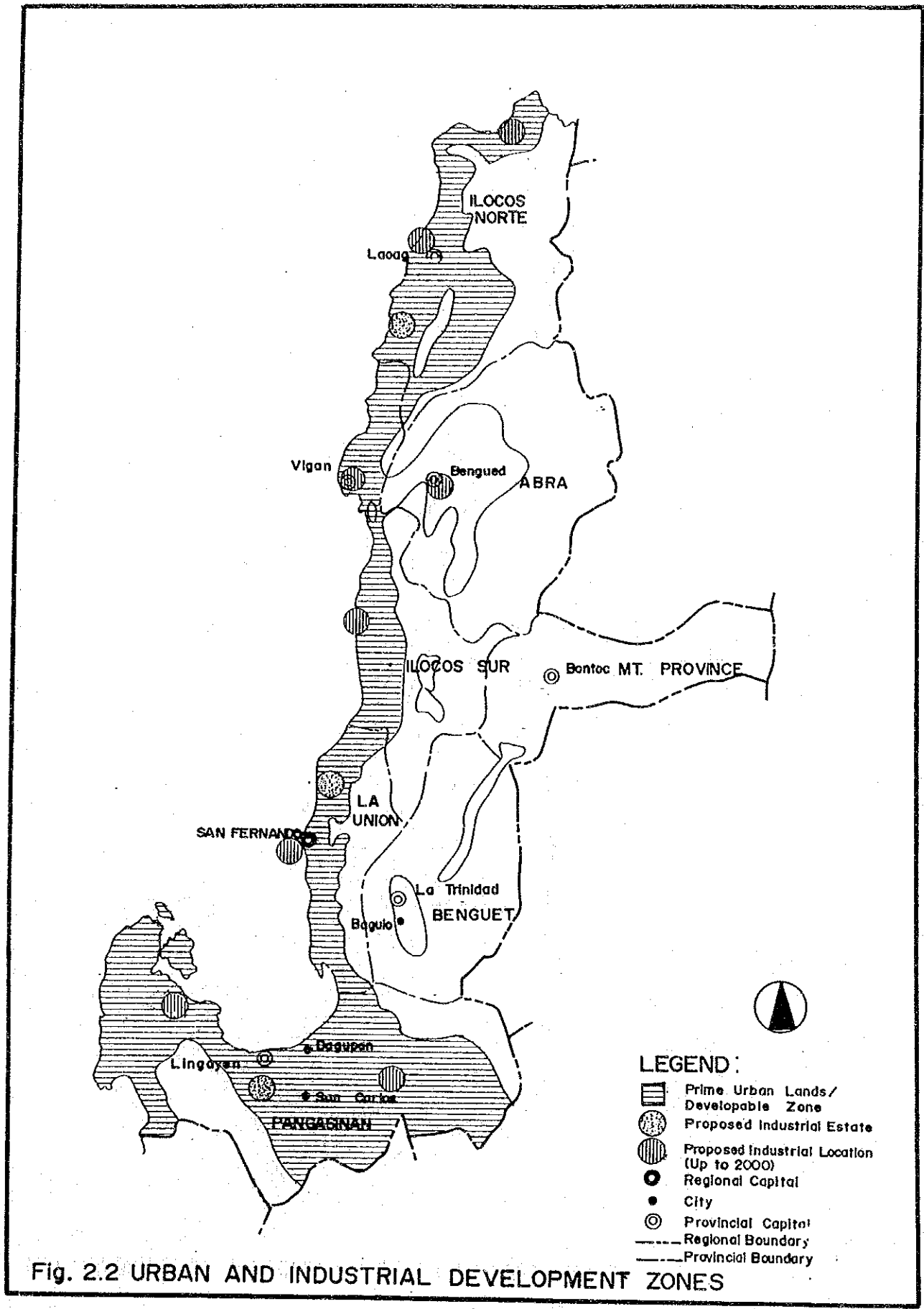
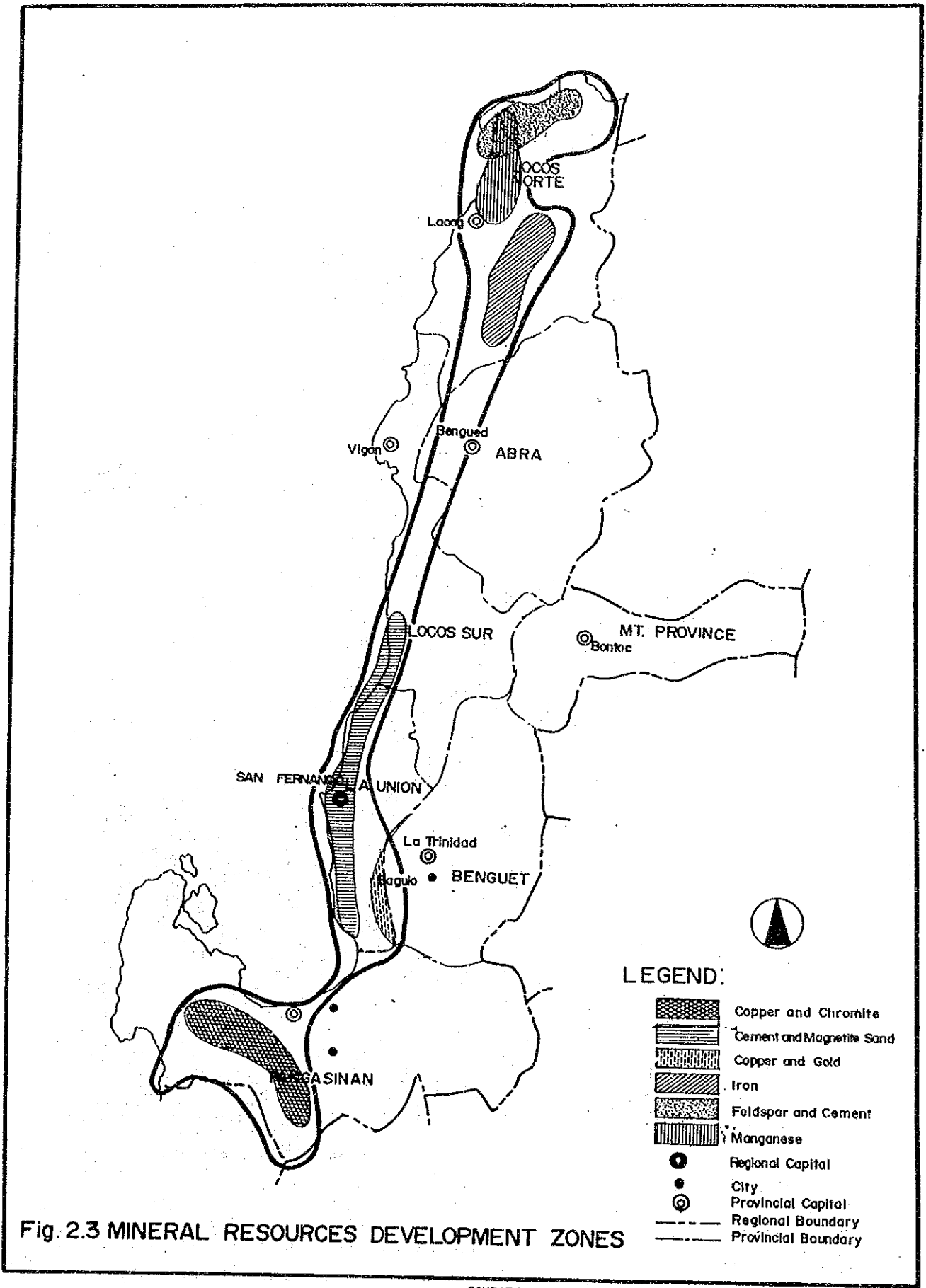


Fig. 2.1 INTENSIVE AGGRICULTURAL DEVELOPMENT ZONES

SOURCE : MEDIUM-TERM ILOCOS REGION DEVELOPMENT PLAN, 1987-1992



SOURCE : MEDIUM-TERM ILOCOS REGION DEVELOPMENT PLAN, 1987-1992



SOURCE : MEDIUM-TERM ILOCOS REGION DEVELOPMENT PLAN, 1987-1992

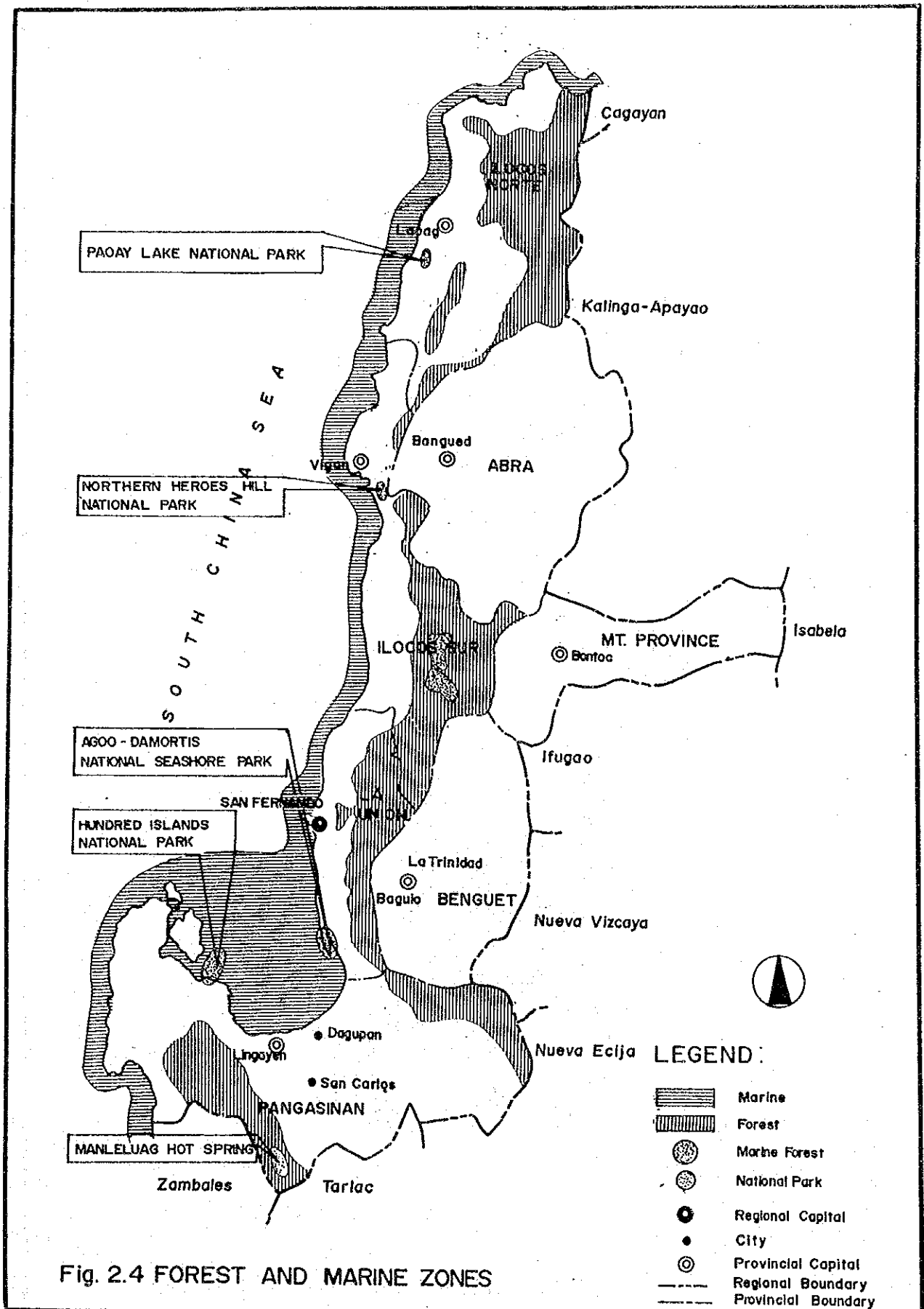


Fig. 2.4 FOREST AND MARINE ZONES

SOURCE : MEDIUM-TERM ILOCOS REGION DEVELOPMENT PLAN, 1987-1992

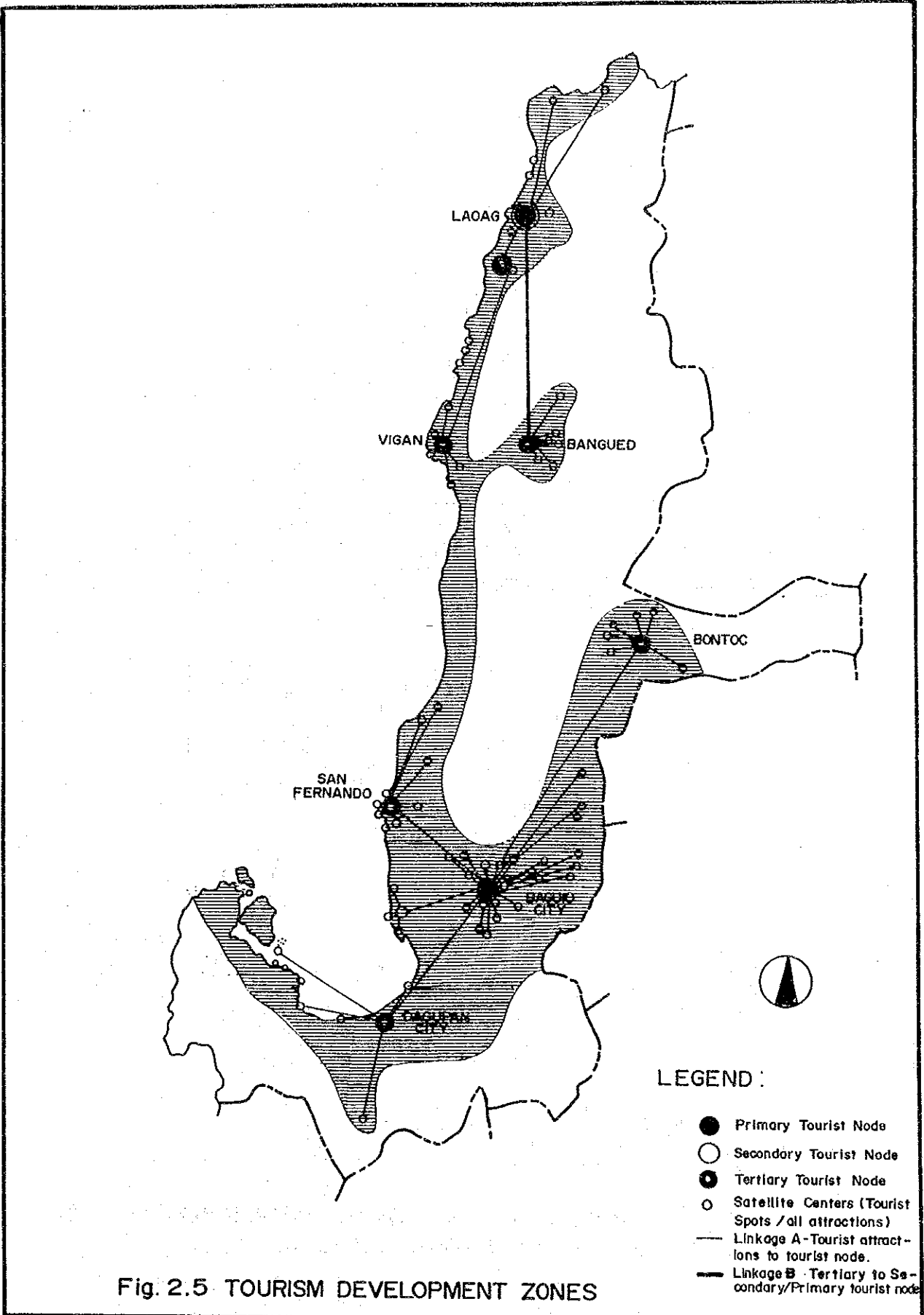


Fig. 2.5 TOURISM DEVELOPMENT ZONES

SOURCE : MEDIUM-TERM ILOCOS REGION DEVELOPMENT PLAN, 1987-1992

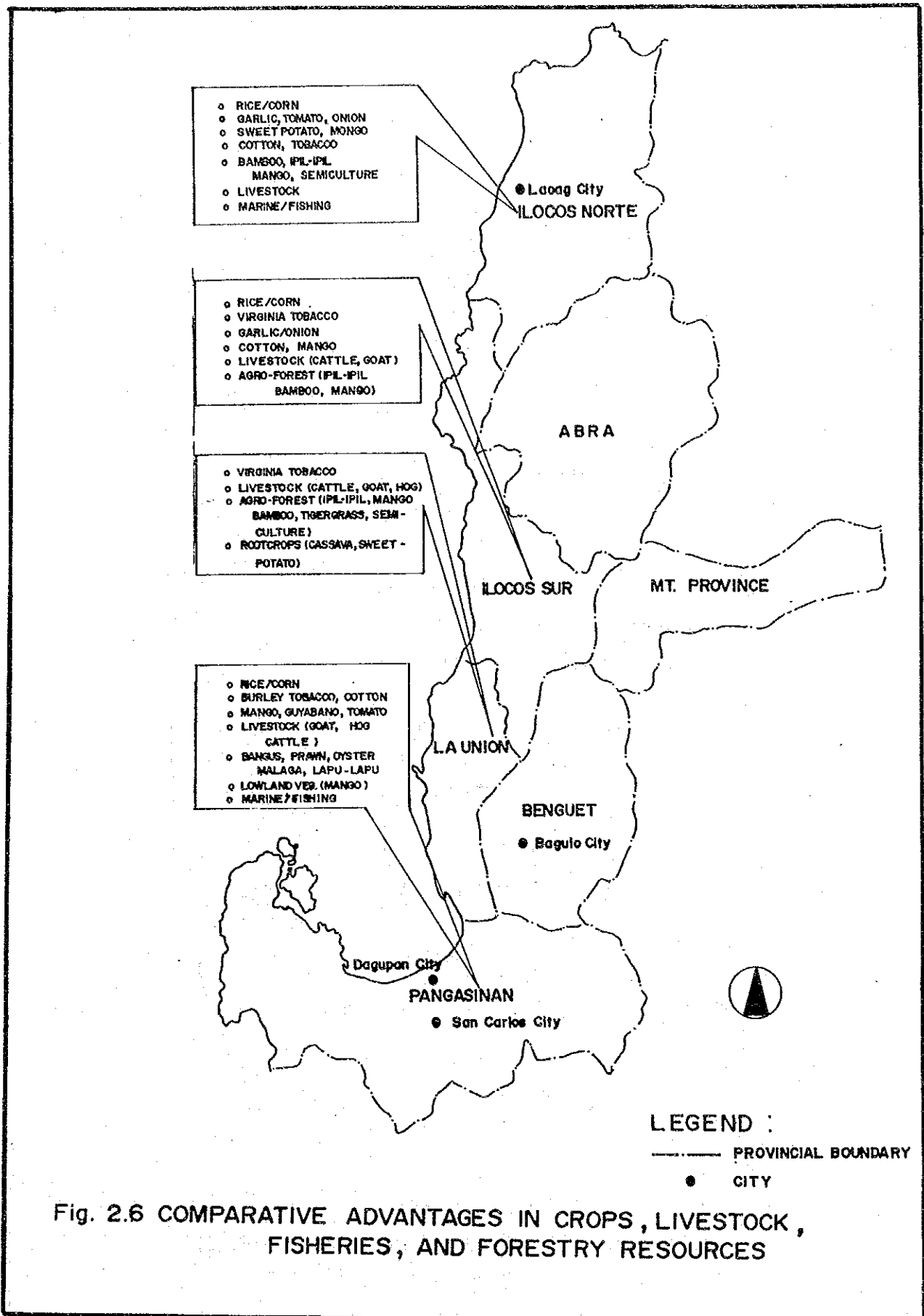


Fig. 2.6 COMPARATIVE ADVANTAGES IN CROPS, LIVESTOCK, FISHERIES, AND FORESTRY RESOURCES

SOURCE : MEDIUM-TERM ILOCOS REGION DEVELOPMENT PLAN, 1987-1992

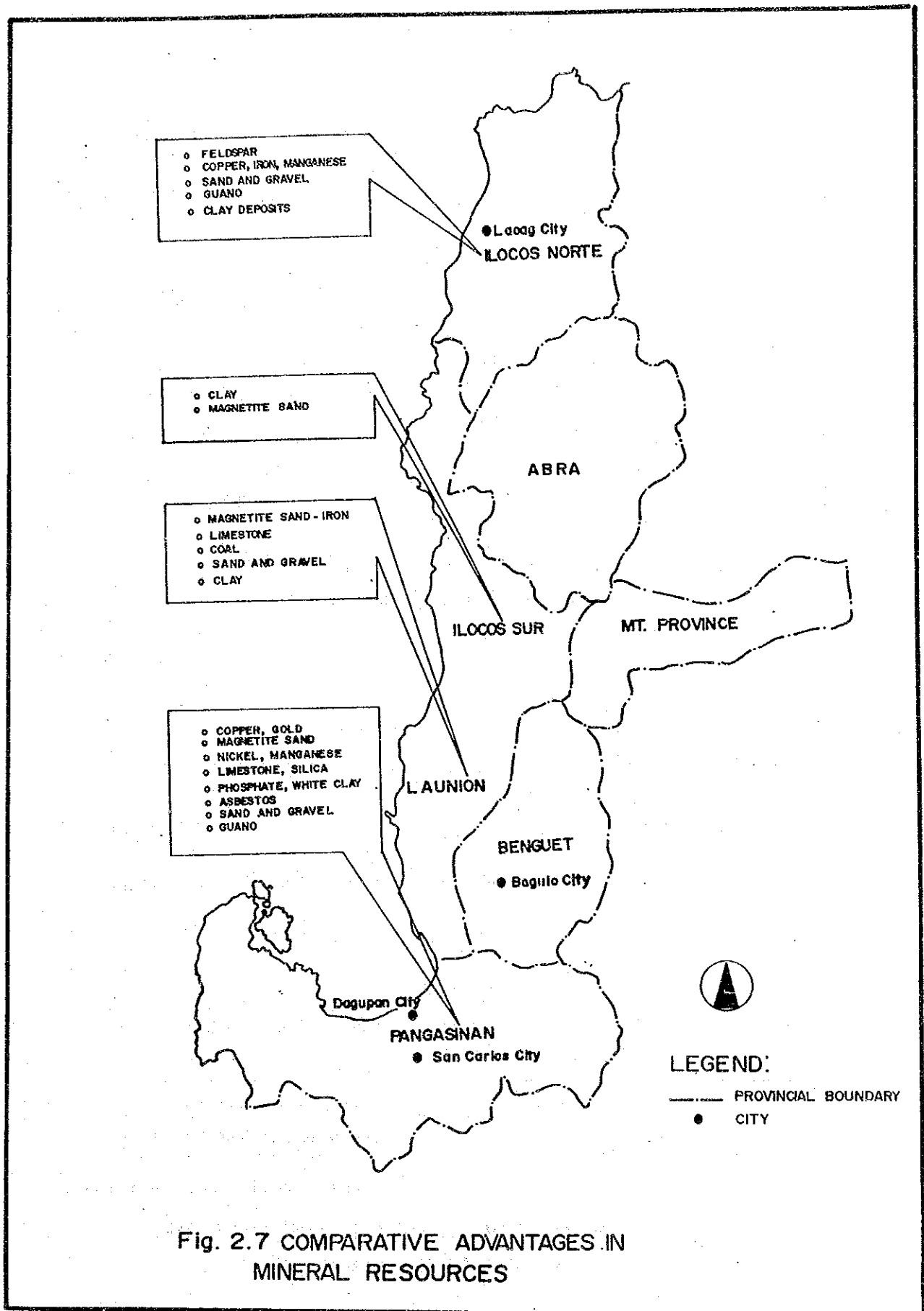
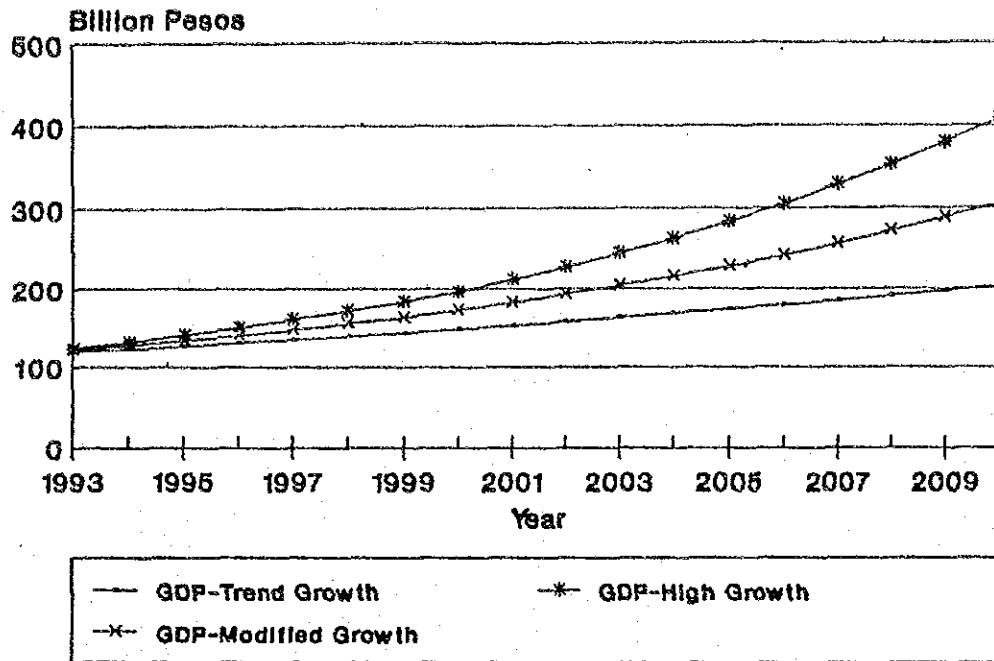
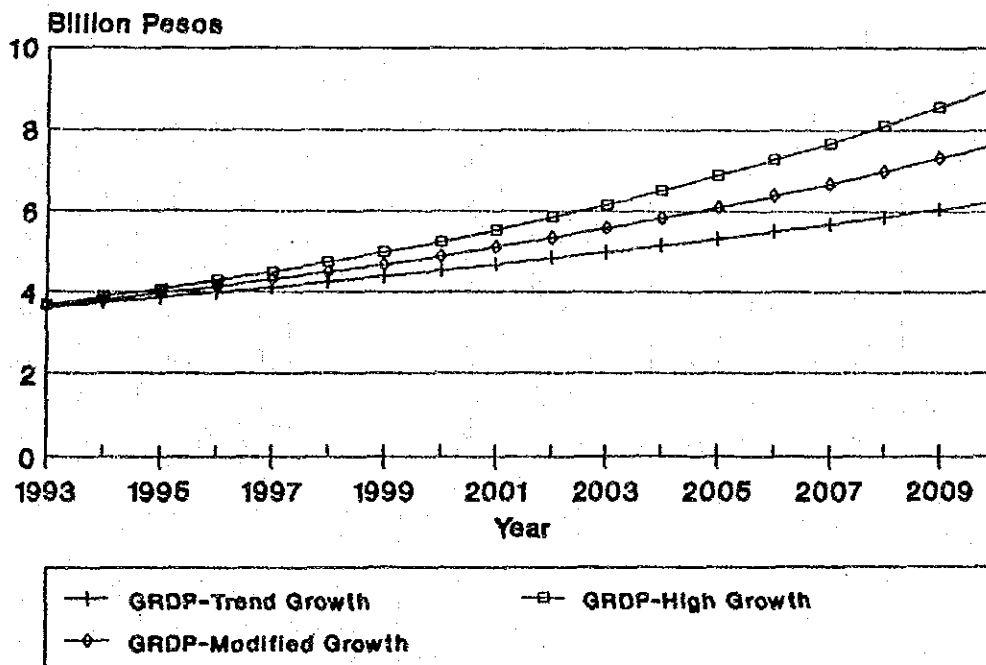


Fig. 2.7 COMPARATIVE ADVANTAGES IN MINERAL RESOURCES

SOURCE : MEDIUM-TERM ILOCOS REGION DEVELOPMENT PLAN, 1987-1992



PROJECTED GDP - 1993 TO 2010
(In Constant 1972 Prices)



• Ilocos Region excluding CAR Provinces

PROJECTED GRDP* - 1993 TO 2010
(In Constant 1972 Prices)

Fig. 4.1 MODIFIED GROWTH SCENARIO

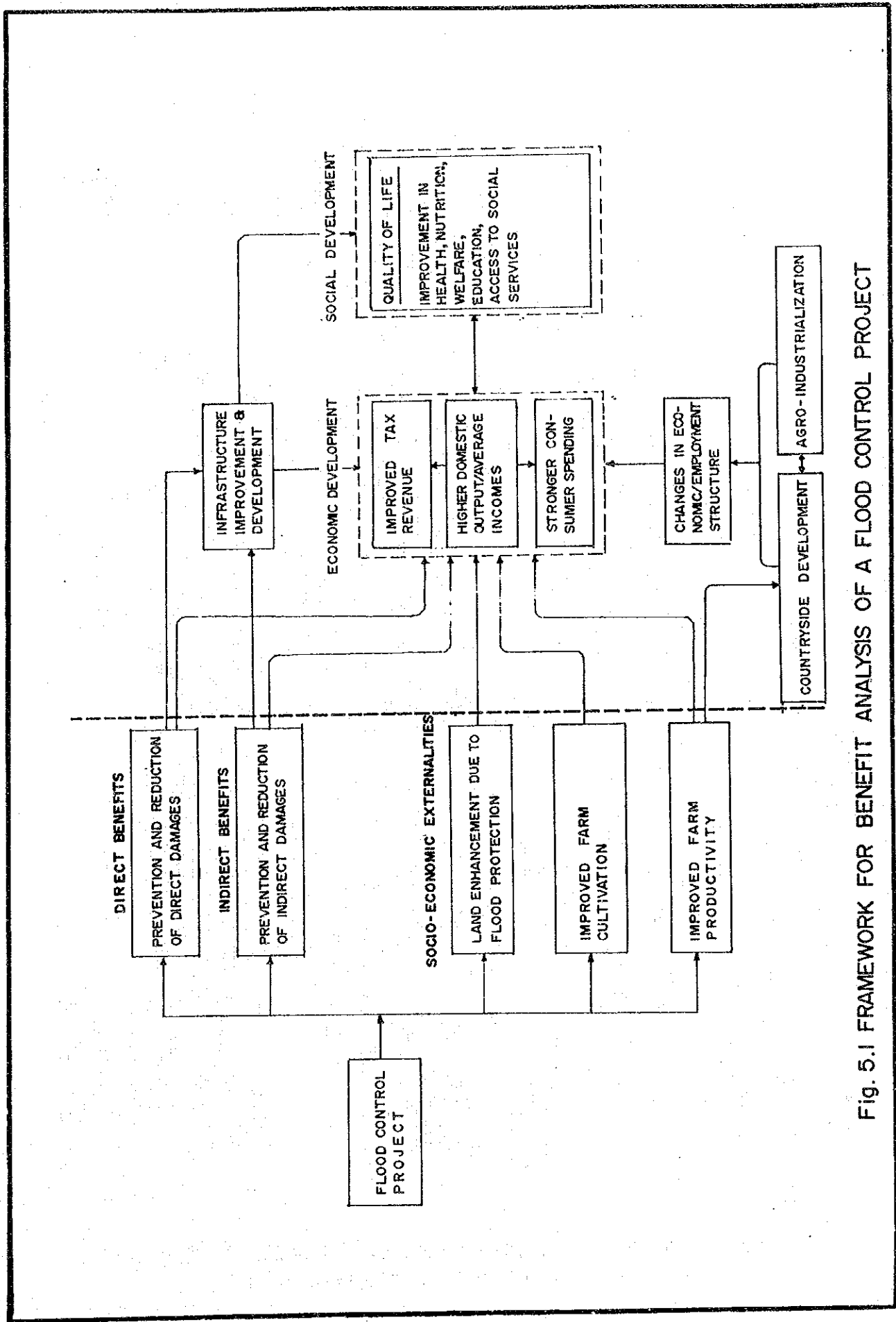


Fig. 5.1 FRAMEWORK FOR BENEFIT ANALYSIS OF A FLOOD CONTROL PROJECT

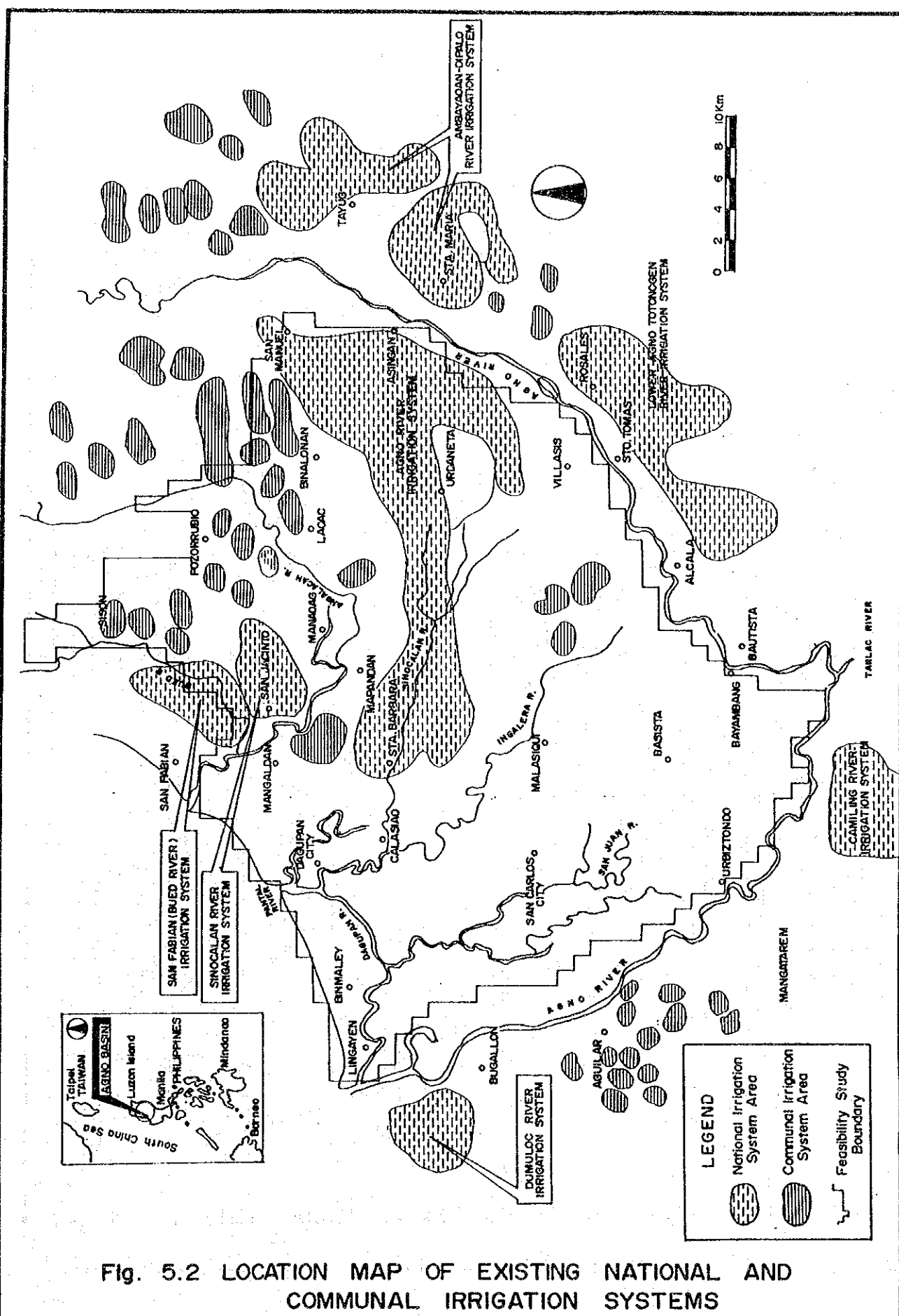
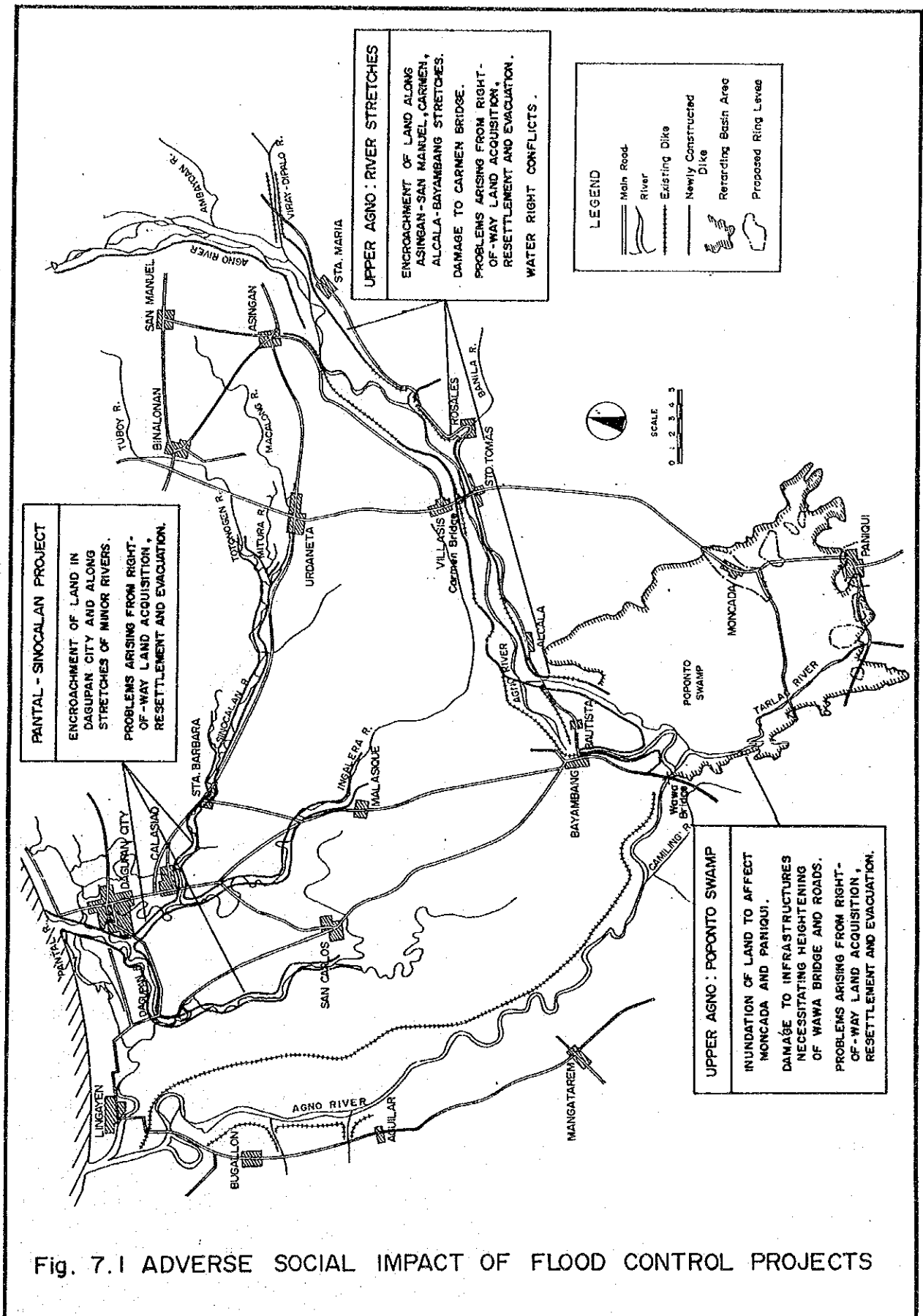


Fig. 5.2 LOCATION MAP OF EXISTING NATIONAL AND COMMUNAL IRRIGATION SYSTEMS

SOURCE : PANGASINAN IRRIGATION PROFILE 1989



2. HY HYDROLOGY

HY : HYDROLOGY

SUMMARY

- (1) Four automatic rainfall gauges and nine automatic water level gauges were installed by AFCS in 1989. The observed meteorological data thereby up to the end of 1990 were compiled in the Data Book.
- (2) Flood analysis was performed to verify the accuracy of the flood runoff simulation model for the Pantal-Sinocalan river by use of additional flood record at the typhoon Bising in 1990. In comparison to the simulation results with the observed flood hydrographs, the flood simulation model is assessed to be unnecessary for modification.
- (3) Poponto swamp is assessed to act as natural retarding basin from the viewpoint of flood control in the formulation of Master Plan in the Agno river. For the assessment of flood control effect by the swamp, the capacity for natural retarding was estimated based on the existing topographic map with scale of 1/50,000. In line with the commencement of Feasibility Study, topographical mapping with scale of 1/25,000 of the swamp area was executed. The H-V curve was thus revised based on the new map, which shows about 40% reduction in its storage capacity at the elevation of 16.00 m.
- (4) As mentioned above, the peak flood discharge in the downstream reaches of Wawa in the Agno river will increase to some extent due to reduction of natural retarding capacity of the Poponto swamp. The design flood discharge distribution of the Master Plan in the Agno river was revised by use of the new H-V curve at the swamp. The revised design flood discharge at the river mouth is summarized as follows :

Protection Level	Previous Design Flood (m ³ /s)	Revised Design Flood (m ³ /s)	Rate of Increase (%)
100-year flood (Framework Plan)	12,300	13,800	12
25-year flood (Long Term Plan)	9,000	10,100	12
10-year flood	6,500	7,400	14

- (5) Sea water intrusion analysis was performed to assess the influence of channel improvement to existing water use along the Pantal-Sinocalan river in comparison with the extent of sea water intrusion under the existing and proposed by-pass channel conditions. The extent of sea water intrusion was assessed assuming that the boundary face between sea water and fresh water clearly exists in shape of salt wedge. The estimated maximum front of salt wedge intrudes about 1 km upstream in addition to the existing condition in case of the proposed by-pass channel. The Sinocalan irrigation dam of the existing water intake facilities which is located about 24 km from the river mouth is assessed to be unaffected by sea water intrusion.

STUDY OF AGNO RIVER BASIN FLOOD CONTROL

HY: HYDROLOGY

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ABBREVIATIONS

1. NAME OF PHILIPPINE GOVERNMENT AGENCIES

AFCS	Agno Flood Control System
AFFWS	Agno Flood Forecasting and Warning System
ARIS	Agno River Irrigation System
DPWH	Department of Public Works and Highways
GOP	Government of the Philippines
NAMRIA	National Mapping and Resource Information Authority
NAPOCOR	National Power Corporation
NIA	National Irrigation Administration
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration.

2. NAME OF JAPANESE GOVERNMENT AND OTHER OFFICIAL AGENCIES AND ORGANIZATION

GOJ	Government of Japan
JICA	Japan International Cooperation Agency
MOC	Ministry of Construction, Japan

3. MEASUREMENT UNITS

(Length)		(Time)	
mm	millimeter (s)	sec	second (s)
cm	centimeter (s)	min	minute (s)
m	meters (s)	hr (hrs)	hour (s)
km	kilometer (s)	dy (dys)	day (s)
		mth (mths)	month (s)
		yr (yrs)	year (s)
(Area)			
m ²	square meter (s)		
km ²	square kilometer (s)		
(Volume)			
m ³	cubic meter (s).pnl		