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STUDY OF

VOLUME V
SUPPORTING REPORT
PART II FEASIBILITY STUDY

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DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

STUDY OF AGNO RIVER BASIN FLOOD CONTROL

FINAL REPORT

VOLUME V

SUPPORTING REPORT
PART II FEASIBILITY STUDY

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SUPPORTING REPORT
PART II FEASIBILITY STUDY

1. SE

SOCIO-ECONOMY

SE : SOCIO-ECONOMY

SUMMARY

(1) The Agno River Basin Flood Control Project (hereinafter called the Project) covers the vast alluvial plain called the Pangasinan plain which is drained by two river basins, i.e. the Agno river basin and the Allied river basin. The river basins provide the economic basis for fairly diversified agricultural production, the full potential of which cannot be exploited owing to recurrent damaging floods.

(2) The Project aims to minimize or prevent damages arising from destructive floods. For flood control, two priority areas have been identified: (a) the Upper Agno river covering the Bayambang stretch. including the Poponto natural retarding basin to the upstream end, and (b) the Pantal-Sinocalan river (downstream stretch). Proposed structural measures include construction or heightening of dikes; construction of bypass channel, floodway, and diversion channels; and improvement of the river channels.

(3) The area directly benefited totals 1,265 sq km^2, spanning 32 settlements, including the cities of Dagupan and San Carlos, as well as Camiling, Tarlac and Rosario, La Union. Seen on the basis of a "growth center" framework, however, Pangasinan within the regional context is clearly the Impact Area of the Project. The growth center approach identifies leading human settlements within a spatial system on the basis of centrality, accessibility, socio-economic influence, and potential for development.

(4) From a spatial perspective, it is clear that all urban center-satellite town groupings of Pangasinan would be affected. Both flood control projects will have a direct bearing on the highly significant Dagupan City-San Carlos City grouping where the heaviest concentration of economic activity and population in the province can be found.

(5) Socio-economic investigation reveals the following profile for Pangasinan: (a) an economy which is dependent on agriculture and fishing but which is fairly diversified and has strong potentials for

agro-based industrialization; (b) a populous province which relies mainly on the primary sector to absorb labor but has substantial and growing secondary and tertiary sectors; (c) a largely rural society with emerging urban centers; and (d) a rural society dependent on farm incomes but which achieves a satisfactory standard of living.

(6) Review of regional performance for 1987-1989 shows that the faster growth envisioned for Ilocos did not materialize. The Region has lagged behind in economic and social development. Advance estimates by National Economic and Development Authority (NEDA) for 1990 also show a slowdown in the macro-economy and negative growth rates in earthquake-ravaged areas like Ilocos. Modified growth projections have been set as follows:

Scenario	GDP (Phil)	GRDP (Ilocos)
High Growth Scenario (%) Adopted in Master Plan		
1992-2000	6.8	5.2
2000-2010	7.6	5.6
Modified Growth Scenario (%) Adopted in Feasibility Study		
1992-2000	5.1	4.3
2000-2010	5.9	4.7

(7) Since Pangasinan is the pacesetter in the Ilocos Region, it is more likely than not that the province would have a relatively faster economic growth. Likewise, growth in the beneficial areas would be faster since these include most of the relatively prosperous and populated centers of the province. Growth projections for the province and the beneficial areas are placed at 4.7% and 4.9%, respectively.

(8) There are two types of flood control benefits: (a) direct benefits stemming from reduction or prevention of flood damages; and (b) other benefits arising from positive effects of flood protection. Flood damage analysis quanties the direct benefits. This is estimated at ₱457.7 million and ₱504.4 million in 1989 prices for the Upper Agno

and the Pantal-Sinocalan basins, respectively, or an aggregate of
₱962.1 million for the two basins. In a 10-year flood return period,
the cumulative annual average flood damages are placed at ₱317.6
million and ₱396.1 million from Upper Agno and Pantal-Sinocalan
basins, respectively, or some ₱713.7 million for both basins.

(9) The above magnitudes are the maximum benefits obtainable on the basis
of flood damage analysis. However, adjustments have to be made to
reflect project design conditions. First, the benefit flow of the
Upper Agno project is reduced by negative benefits arising from the
wider inundation of the Poponto Swamp. This is estimated, net of
countermeasures, at ₱34.2 million. Second, the river improvement
component of the Pantal-Sinocalan project does not extend up to the
upper reaches of Ingalera, Macalong, Tagamusing, and Tuboy rivers.
This means the reduction in the Pantal-Sinocalan benefit flow from
₱396.1 million to ₱317.6 million. In summary, the adjusted benefit
flows come to ₱207.0 million and ₱207.0 million for the Upper Agno and
Pantal-Sinocalan projects, respectively, or some ₱582.4 million for the
two projects.

(10) Other benefits may arise as a result of implementing the flood control
projects, namely: (a) land enhancement, (b) greater agricultural
production, (c) improved agricultural productivity, (d) development of
agro-industries and aqua-based industries (e) changes in economic
structure and employment structure, (f) increase in per capita income
and consumption, and (g) improvement in quality of life. Through
input-output (I/O) analysis and through use of simplifying assumptions
("what-if" cases), quantification of the other benefits have been
attempted. The results support the rationale to use a growth factor
for the benefit flow since value of assets will increase in areas that
would benefit from the flood protection.

(11) In the I/O approach, flood control works are regarded as
infrastructure activities which are captured under "construction
sector" or Sector 46 of the 66x66 matrix of the Input-Output Tables
(1983 update). Examination of the inter - industrial relationships of
construction shows the impact of flood control on other industry
sectors is significant.

(12) Through use of simplifying assumptions, quantification of the monetary
impact of land enchancement, increased farm production and greater
farm productivity has been tried. Potential values that can be created
are conservatively estimated at ₽1.1 billion annually which exceeds
the direct benefits derived in flood damage analysis.

Measured Monetary Impact of Other Benefits
Through Use of Simplifying Assumption (₽'000)

Benefits	Upper Agno	Pantal- Sinocalan	Cayanga- Patalan	Total
Land Enhancement	111,658	583,146	123,402	818,206
Greater Farm Production	15,383	35,187	10,977	61,547
Improved Farm Productivity	50,071	136,414	35,604	222,089
Total	177,112	754,747	169,983	1,101,842

The measured monetary impact demonstrates that it is realistic to use
a growth factor for the benefit flow to reflect future development in
an area that would benefit from flood control.   This is assumed at
4.9% in real terms, the same rate as the projected growth of GRDP in
the beneficial areas.

(13) The economic efficiency of the projects is assessed on the basis of :
(a) Economic Internal Rate of Return (EIRR), and (b) Net Present Value
(NPV).   The project is considered acceptable (a) if the EIRR equals
or exceeds the social discount rate; or (b) if the NPV is greater than
zero.   The social discount rate, defined as the opportunity cost of
capital or the rate of return at which the funds would have earned in
its best alternative use, is set at at 15%.

(14) Four cost-benefit runs are made: (a)   Case A: Upper Agno project
alone; (b) Case B: Pantal-Sinocalan project alone; (c) Case C: Upper
Agno and Pantal-Sinocalan projects together (Simultaneous

Implementation); and (d) 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).

Further, the study employs two benefit flows during the useful economic life of 50 years: (a) Case 1: Current Development Condition (Constant Benefit Flow) which assumes that the value of assets within the project beneficial areas remains unchanged through the project life, and (b) Case 2: Future Development Condition (Future Benefit Flow) which assumes that the value of assets increases at 4.9% annually in real terms.

(15) The results of the cost-benefit analysis are summarized below:

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 (%)	7.73	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 (%)	7.52	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 A: Uper Agno project. Under the Future Development Condition, Case A: Upper Agno projeect has the highest EIRR at 20.58%. At a discount rate of 15%, the NPV is estimated at ₱976 million. This is the best option for GOP consideration.

(16) Social costs will arise from: (a) encroachment of land; (b) inundation of land; (c) damage to infrastructures, (d) conflicts arising from land acquisition and resettlement, (e) probable increase in incidence of malaria and other water related diseases; (f) water rights conflicts; and (g) seawater intrusion. The number of residents to be affected by the right-of-way acquisition, evacuation and resettlement comes to some 91,000, a population size bigger than Urdaneta's.

(17) Social benefits are expected to outweigh the social costs. Protection to lives, properties and livelihood will enhance long-run development of the river basin economy. The fuller development of river basin economy will give rise to increased farm productivity and production. This translates to higher incomes and expanded job opportunities. The improvement in socio-economic conditions of human settlements within the beneficial areas will be felt throughout the Impact Area.

(18) Flood protection in the Agno/ Allied river basins will also have positive spread effects on the regional and national economies. Pangasinan will be able to live up to its defined development role as a pacesetter and to spur regional growth. A Pangasinan-led regional growth, on the other hand, will help Ilocos bridge the development gap with more advanced regions and thereby contribute to the achievement of national development goals.

SE: SOCIO - ECONOMY

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ABBREVIATIONS

CAIDS	Countryside Agro-Industrial Development Strategy
CAR	Cordillera Autonomous Region
CDR	Crude Death Rate
DA	Department of Agriculture
DTI	Department of Trade and Industry
EIRR	Economic Internal Rate of Return
GDCF	Gross Domestic Capital Formation
GDP	Gross Domestic Product
GNP	Gross National Product
GOP	Goverment of the Philippines
GRDP	Gross Regional Domestic Product
ICOR	Incremental Capital-Output Ratio
I/O	Input-Output
IMF	International Monetary Fund
IMR	Infant Mortality Rate
LOI	Letter of Intent
MTIRDP	Medium-Term Ilocos Region Development Plan
MTPDP	Medium-Term Philippine Development Plan
NCR	National Capital Region
NEDA	National Economic and Development Authority
NPV	Net Present Value
NSCB	National Statistical Coordination Board
NSO	National Statistics Office
PIE	People's Industrial Enterprises
RDC	Regional Development Council
RIC	Regional Industrial Center

1. INTRODUCTION

1.1 Project Background

The Agno River Basin Flood Control Project (hereinafter referred to as the Project) aims to minimize damages arising from recurring floods in the area. The Study Area of the Project, situated in the Luzon heartland, is often plagued by typhoons which bring about heavy rainfalls and cause destructive floods.

Two priority flood control areas have been identified in the Master Plan: (a) Upper Agno River: from the Bayambang stretch, including the Poponto natural retarding basin, to the upstream end; and (b) Pantal-Sinocalan River (Dagupan City urban stretch and downstream stretches of several minor rivers).

The Project will have structural and non-structural components. In the Feasibility Study Stage, these have been defined.

The proposed flood control structures include:

Priority Project	Design Features
Upper Agno Project	
Asingan-San Manuel Stretch	Alignment of set back levees on the right and left banks.
Carmen Stretch	Heightening of concrete dike on the left bank in the upstream and downstream of the Plaridel (Sison) bridge; construction of earthdike at the river side; construction of set back levee on the right bank.
Alcala-Bayambang Stretch	Construction and heightening of dikes; construction of new Alcala-Poponto floodway and weir; demolition of Alcala inlet weir; channel improvement.

Priority Project	Design Features
Poponto Swamp	Construction of protection levees for affected towns; provision of mounds for resettlement.
Pantal-Sinocalan Project Dagupan Urban Stretch	Construction of a bypass channel from Sinocalan river to Dagupan river; widening of river width.
Minor River Stretches	Construction of levees along the Dagupan, Ingalera, Sinocalan, and Totogonen rivers.

1.2 Objectives of the Socio-Economic Analysis

The socio-economic analysis in this study stage aims to:

(i) Describe the broad development context of the Agno River Basin Flood Control Project;

(ii) Determine the current socio-economic conditions of the Impact Area;

(iii) Assess probable future socio-economic conditions;

(iv) Estimate the economic benefits of the Project;

(v) Undertake an economic cost-benefit analysis of each priority project; and

(vi) Assess the socio-economic impact of the Project.

The first three items constitute the socio-economic survey while the last three items comprise the economic evaluation of the Project. The socio-economic survey provides the development background of the Project while the economic evaluation aims to ascertain its desirability in terms of net contribution to the social and economic welfare of the country.

1.3 Location and Description of the Impact Area

1.3.1 Definition of the Master Plan and Feasibility Study Areas

The Master Plan Study Area covers two river basins and the vast alluvial plain called the Pangasinan plain. Rivers from the Cordillera and Zambales mountains drain the plain into the Lingayen Gulf. The longest of these rivers is the 275 km long Agno river which flows from its sources in Ifugao down the southern slopes of the Cordilleras. It goes in a southerly course to Tayug where it veers off southwest through Villasis and Bayambang into Poponto swamp. It then flows northward, skirting the eastern slopes of Zambales mountains, till it empties into Lingayen Gulf. Agno's major tributaries are the Tarlac, Camiling, Ambayaoan, Viray-Dipalo, and Banila rivers.

In the northwestern part of the Pangasinan plain, there is a group of medium-size rivers known as the Allied Rivers which also discharges into Lingayen Gulf. This consists of the Pantal, Sinocalan, Cayanga, and Bued rivers.

Figure 1.1 shows the Master Plan Study Area's drainage area totaling about 7,640 km^2, broken down into 5,907 km^2 for the Agno river basin and 1,733 km^2 for the Allied river basins. The river basins provide the economic basis for fairly diversified agricultural cultivation, although it has remained largely paddy.

The Master Plan Study Area straddles nine (9) provinces of the Ilocos (Region I), the Cordillera Autonomous Region (CAR), Cagayan Valley (Region II), and Central Luzon (Region III). These are: Benguet, La Union, Pangasinan, Ifugao, Nueva Vizcaya, Nueva Ecija, Pampanga, Tarlac, and Zambales. It covers 83 municipalities out of 189 municipalities in the 9 provinces.

During the wet season, Agno river and its tributaries often overflow and flood the nearby lowlands. The lowlying Allied rivers are also affected by the overtopping. To prevent this yearly occurrence, the Master Plan identifies two priority areas where flood control will be optimal. Figure 1.2 delineates the Feasibility Study Area which comprises the identified

priority flood control areas in Upper Agno and Pantal-Sinocalan. Administratively, the Feasibility Study Area includes thirty-two (32) cities and municipalities, with an aggregate area of 2,529.7 km^2.

1.3.2 Definition of Maximum Inundation Area and Project Beneficial Areas

Figure 1.3 shows the maximum inundation area in the Master Plan or the maximum area that would be flooded as determined by the flood inundation analysis. The maximum inundation area is estimated to have an area of 2,465 km^2, largely covering the cultivated lands in the flood plains of the Agno river and the Allied rivers in Pangasinan and Tarlac.

The maximum inundation areas, broken down by river basins, serve as the basis for defining the project beneficial areas or the areas which will benefit from the flood control projects.

Project Beneficial Area	Area (Km^2)	Affected Settlements
Upper Agno River Basin	180	12
Pantal-Sinocalan Basin	879	17
Cayanga-Patalan Basin	205	10
Total	1,264	32

Source: Flood Damage Analysis Report, 1991.

In this regard, the Upper Agno project has a beneficial area of 1,264 km^2, covering entirely the lowlands along the Allied rivers. It spans 32 human settlements in central and northwestern Pangasinan, including the cities of Dagupan and San Carlos, as well as the towns of Camiling in Tarlac and of Rosario in La Union. This overlaps with the beneficial area of the Pantal-Sinocalan project, which covers 879 km^2, including fifteen (15) municipalities and two (2) cities in Pangasinan.

1.3.3 Definition of the Impact Area

Seen on the basis of a "growth center" framework, however, the two priority projects are likely to have a socio-economic impact extending beyond the confines of their respective beneficial areas. Figure 1.4 groups together Pangasinan's urban centers and their satellite municipalities as based on the hierarchy of settlements.

Urban Center	Satellite Municipalities
Dagupan City - San Carlos City	Mangaldan, San Fabian, Jacinto, Mapandan, Sta. Barbara, Calasiao, Malasiqui, Bayambang, Binmaley, Bautista.
Urdaneta	Alcala, Sto. Tomas, Villasis, Manaoag, Binalonan, Pozzorubio, Sison, Basista. Laoac
Tayug	Sta. Maria, Umingan, San Nicolas, San Quintin, Natividad, San Manuel, Asingan, Balungao, Rosales.
Lingayen	Urbiztondo, Sual, Labrador, Bugallon, Aguilar, Mangatarem.
Alaminos	Bolinao, Anda, Agno, Burgos, Mabini, Dasol, Infanta, Bani.

Source: Medium-Term Ilocos Region Development Plan, 1987-1992.

The growth center approach identifies leading human settlements that pace growth within a spatial system on the basis of centrality, accessibility, socio-economic influence, and potential for development. This framework views the growth center and its rural hinterland as a single integrated system of production, processing and trading. Since the priority project areas cut across several such spatial systems, flood control has an impact extending beyond the geographic area where the projects are situated.

Moreover, the project priority areas span most of Pangasinan's growth centers, Dagupan City, San Carlos City, Lingayen, Urdaneta and Tayug. Dagupan City is the province's center of trade and commerce. San Carlos City is an emerging agro-processing center. Lingayen is the seat of provincial administration. Urdaneta and Tayug are significant trade centers and serve as market towns for smaller municipalities, although Tayug is seen losing in importance to upcoming Rosales. Villasis is also fast coming up as a market town. Protection of these relatively prosperous and populous centers will redound to the benefit of the province's economy.

In this regard, both priority projects will have greatest bearing on the Dagupan City-San Carlos City group and, to a lesser extent, on the Urdaneta group. Specifically, diking systems will protect settlements along

the left and right banks of Upper Agno. With the use of Poponto swamp as a natural retarding basin, flood discharges are controlled, benefiting municipalities down the Lower Agno stretches and along the lowlying Allied rivers. The proposed bypass channel in Dagupan City, on the other hand, will protect urban stretches in the city and relieve flood pressures in Calasiao, Sta. Barbara and other nearby municipalities. The levees on the minor rivers will safeguard towns in the Pantal-Sinocalan basin.

Only the Upper Agno project will have an impact on the Tayug grouping. Of the Lingayen grouping, only Lingayen and Urbiztondo are within the project beneficial areas. The Alaminos grouping is outside the beneficial areas. But because of the significance of the river basins on Pangasinan's economy, flood protection will have an impact on both groupings. It is therefore appropriate to view Pangasinan as the Impact Area of the Project. Table 1.1 shows the demographic profile of cities and municipalities affected by the Project. Table 1.2 delineates the areas and settlements in the project beneficial area, broken down by river basin.

In like manner, benefits accruing to Pangasinan will also redound to the Ilocos Region, to which it belongs administratively. Since Pangasinan is the pacesetter for Ilocos Region, the Project will have a significant impact on the regional economy. Ilocos Region is therefore the broader Impact Area of the Project.

The Project's impact will neither be confined to the beneficial areas nor is this expected to be entirely positive. Negative social impacts are anticipated in settlements inside and outside the beneficial areas. For instance, the probable wider inundation of the Poponto retarding basin in the future could affect northern towns of Tarlac, particularly Moncada, Paniqui, and, to a lesser extent, Camiling. These affected towns should also be regarded as within the Impact Area. Since these towns have similar socio-economic conditions as Pangasinan's, focusing the socio-economic discussion on the latter and on the Ilocos Region should not substantially affect the findings.

To summarize, the Project will have an impact on the following areas, listed in the decreasing order of influence:

(i)   Dagupan City, San Carlos City, Urdaneta and Tayug, and their satellite municipalities within the beneficial areas.

(ii)   Lingayen and Urbiztondo as well as Camiling, Tarlac and Rosario, La Union which are within the beneficial areas.

(iii)   The satellite municipalities of Lingayen which are part of the Study Area.

(iv)   The northern towns of Tarlac particularly Moncada and Paniqui.

(v)   The entire province of Pangasinan (including Sual, which is part of the Lingayen grouping; and Alaminos and its satellite municipalities).

(vi)   The Ilocos Region.

The socio-economic survey focuses on Pangasinan within the broad context of the Ilocos Region. Estimation of project benefits and economic evaluation focus on the project beneficial areas. Lastly, the socio-economic impact analysis extends through the Impact Area.

2. DEVELOPMENT FRAMEWORK OF THE PROJECT

2.1 National and Regional Development Goals

2.1.1 Medium-Term National Development Goals

The Project must be linked with national and regional development efforts. Development plans as well as policy actions of the Government of the Philippines (GOP) have been therefore analyzed to determine the broad development framework of the Project.

Since 1986, two milestones have guided GOP development thrusts: (a) full recovery, defined as restoration of per capita income to its highest level (₱1,921 achieved in 1981) by year 1992, and (b) achievement of the status of a Newly Industrializing Country (NIC) by year 2000.

The broad framework for growth and development has been outlined in the Medium Term Philippine Development Plan (MTPDP) for 1987-1992. The plan sets an economic growth target of 6.7% annually for the 1988-1992 period to achieve full recovery. After 1992, growth is envisioned to accelerate to ensure attainment of NIC status.

Key development goals are alleviation of poverty; generation of more productive employment; promotion of equity and social justice; and attainment of sustainable economic growth. Further, the plan lays down guiding principles for the economy, namely: emphasis on the rural-based development and agriculture; stress on economic efficiency and comparative advantage in industrial development; commitment to continued structural reforms; and reduced government involvement in the economy and emphasis on private initiative.

2.1.2 Regional Development Thrusts

Paralleling the national development thrusts, the GOP has embarked on regional development. The objectives are: (a) to accelerate the growth of less developed regions and achieve a more balanced spatial development; and (b) to promote efficient development and utilization of resources.

The rural-based strategy is seen to promote a balanced growth among regions. The Regional Development Council (RDC) of each region formulated medium-term plans to articulate development vision and strategies. Each region's development role was defined on the basis of resource endowment and comparative advantage.

The thrust towards regional development was reinforced recently by the Countryside Agro-Industrial Development Strategy (CAIDS). This rural development-oriented approach aims to modernize agriculture and improve rural productivity, promote industrial growth and dispersal, and advance the economic integration of the country.

Under CAIDS, Metro Manila and the industrial areas of Central Luzon and Southern Tagalog form the primary industrial core (See Updates of the Philippine Development Plan 1990-1992, National Economic and Development Authority (NEDA), 1990). The Ilocos and Cagayan Valley will be major producers of agricultural and industrial materials. The Cordilleras will continue as a major tourist destination. Bicol will be an agricultural and mineral production center.

The strategy for the Visayas is to promote economic integration within and among the islands. The Cebu-Cagayan de Oro-Iligan industrial core will be the anchor of such integration. The focal points for inter-Visayas integration are the Regional Industrial Centers (RICs) to be set up in Tacloban City, Cebu City and Iloilo City.

Mindanao will become a major agro-processing and trading area. RICs in Davao, General Santos, Zamboanga, and Cotabato-Parang will form the Southern Philippines industrial corridor. These will anchor development of their respective regions. The Autonomous Region of Muslim Mindanao will consist of an RIC in Maguindanao and agro-processing facilities in Marawi.

Sixteen RICs will be established to serve as focal points for agro-processing, industrial dispersal and economic decentralization. Each RIC will be complemented by a system of People's Industrial Enterprises (PIEs). The latter are actually mini-industrial estates located in municipal clusters to serve small and medium-scale manufacturing enterprises.

2.2 The Role of the Impact Area in Philippine Development

2.2.1 Development Role of the Ilocos Region

Consistent with the strategy to balance regional development, faster growth was planned for Ilocos Region.

Ilocos Region Development Targets	1987	1992
Gross Regional Domestic Product		
Million Pesos (1972 Prices)	4,265	6,099
Average 1987-1992 Growth Rate (%)		7.4
Per Capita GRDP		
In Pesos	1,052	1,370
Average 1987-1992 Growth Rate (%)		5.5
Population Projections		
Population (In Thousand)	4,060	4,450
Population Growth Rate (%)		1.9
Labor Force and Employment		
Labor Force (In Thousand)	1,530	1,755
Employed	1,372	1,683
Employment Rate	89.7	95.9

Note: Projections apply to Ilocos before transfer of Abra, Benguet and Mt. Province to Cordillera Autonomous Region (CAR).

Source: Medium-Term Philippine Development Plan, 1987-1992

The role of Ilocos Region (now consisting of the lowland coastal provinces of La Union, Ilocos Sur and Ilocos Norte as well as the basin province of Pangasinan) is seen primarily as a resource supplier by the Medium-Term Ilocos Region Development Plan (MTIRDP), 1987-1992.

This is also basically the same development role envisioned for the region under CAIDS, although the latter stresses pursuit of a more balanced agro-industrial development. Within this regional development framework, the four Ilocos provinces are viewed primarily as a source of raw materials, a producer of food, and a provider of manpower resources.

Figures 2.1 to 2.5 defines the spatial development strategy showing potentials for: (a) intensive agricultural development; (b) urban and industrial base development; (c) mineral resource development; (d) forest and marine ecological development; and (e) tourism development. Figures 2.6 and 2.7 summarize the comparative advantages of each Ilocos province.

The prime lands for crop production are located along the region's coast and within major river basins. The outer margins of these prime croplands are also being placed under cultivation. The region has comparative advantage in rice, corn, tobacco, mango, garlic, tomato, and vegetables.

For fish farming, the principal production area is the large estuarine at the mouth of the Agno and Bued Rivers. Other fishing areas dot the coast from La Union to Ilocos Norte. Large tracts of pasture lands in Pangasinan and the upland areas of the Ilocos provinces are used for livestock raising. Urban development and industrial lands are located along the region's coastal strip, within extensive river valleys and within the Pangasinan basin.

The MTIRDP is promoting such agro-based and resource-oriented industries as garlic processing, tomato paste production, mango juice processing, animal feed milling, flour milling, and aqua-based processing (bangus, bagoong, patis).

Other industries to be encouraged include: tobacco manufacture and structural clay in Ilocos Norte, Ilocos Sur, and La Union; and leather production, agricultural machinery, transport equipment, furniture and fixture, and handicraft in Pangasinan.

Mining activities are concentrated mainly in parts of Pangasinan and La Union. On the other hand, the tourist zone covers the region's coastlines, starting from the tip of Ilocos Norte, down south along the beaches of Ilocos Sur and La Union and around the Lingayen Gulf.

2.2.2 Development Role of Pangasinan

In line with the regional development framework, the Department of Trade and Industry (DTI) has further outlined the following development vision, namely, for Pangasinan to become:

    (i)   A primary manufacturing and trading center in Ilocos Region by year 1992; and

    (ii)   A major exporting province of the Philippines by year 2000.

In line with the development vision, DTI has defined the following development thrusts for Pangasinan: (a) enhancement of agricultural productivity; (b) development of livelihood and industry; (c) improvement of health and nutrition; (d) improvement of peace and order; and (e) generation of revenues.

Specific development strategies include:

    (i)   Development and expansion of the Sual Fish Port area into a provincial industrial center;

    (ii)   Development and expansion of agri- and aqua-based processing centers;

    (iii)   Development of PIE zones (mini-industrial estates organized at the district level) to attract investments in gifts and housewares, ceramics, furniture, metalcraft, and fish processing;

    (iv)   Development of mining and quarrying industry;

    (v)   Establishment of marketing support facilities in key areas like Urdaneta, Dagupan City and Alaminos;

    (vi)   Intensification of export and domestic promotion activities;

    (vii)   Intensification and diversification of agricultural production;

    (viii)   Development of an efficient freight and cargo system.

The above development vision fits Pangasinan's resource endowment perfectly. DTI enumerates the province's comparative advantages include: vast farmlands and substantial water resources; rich marine resources in Lingayen Gulf and extensive areas for fishpond development; availability of mineral resources; skilled craftmanship; and favorable geographic location.

Owing to extensive croplands and abundant water resources, Pangasinan is the leading producer of rice, corn, vegetables and livestock in the region. It also abuts the fishing grounds of Lingayen Gulf. Fish farming abound in the coastal areas and certain river stretches of the province.

With relative availability of food raw materials and proximity to expanding consumer markets, Pangasinan can easily develop and promote indigenous food manufacturing industries.

Pangasinan is endowed with mineral deposits of commercial quantities, largely chromite ore, copper and silica. It has also abundant red clay deposits for brick manufacturing. Deposits of kaolinite, a primary raw material for manufacture of porcelain and china wares, remain relatively untapped.

Pangasinan boasts of manpower skilled in crafts. Basista is reputed for buri rope making and coco-midrib handicrafts; Pozzorubio for hamper-making; and Sta. Barbara for brickmaking. This can be the basis for promoting an export-oriented crafts industry.

As the gateway of the Ilocos Region, Pangasinan assumes the link-up function between North-South routes and, to some extent, the East-West routes. This has given rise to the importance of Urdaneta, Villasis and Rosales (Carmen) as trading centers.

Pangasinan is close to transshipment points like Baguio City and Mariveles, Bataan; and, possibly in the future, Poro Point, La Union; Subic, Zambales; and Angeles City (Clark). Likewise, it is near San Fernando, La Union, which is being groomed as the RIC for Ilocos.

2.2.3 Development Role of the Agno/ Allied River Basins

Given the above development framework, the Agno river and the Allied river basins have an important role as a resource base. As a source of water resources, they give rise to establishment of hydropower generating facilities, irrigation systems and flood control works. Taken together, electrification, irrigation and flood control lead to expanded rural production, increased incomes and higher quality of life.

The location of the two river basins in the Pangasinan plain also make them a significant spatial component of the region. Floods suspend economic activities not only within the province itself but, in view of traffic blockades, also hamper activities outside the area.

Cognizant of this, authorities have long tried to tap the potentials of the river basins. The Ambuklao and Binga dams in the upper reaches of the Agno river are used for hydropower generation with a combined installed capacity of 916 GWh.

The ongoing Balog-balog dam project in the upper reaches of the Bulsa river in the province of Tarlac is envisioned for irrigation water supply for a net area of some 39,150 ha and for power generation of about 100 GWh.

San Roque dam is planned in the upstream of the Agno river, designed for hydropower generation and irrigation water supply. The project will provide irrigation water supply for about 87,000 ha and generate about 1,200 GWh of power annually.

The planned flood control works in Pantal-Sinocalan river and in the Upper Agno river are seen to reduce damages from recurring floods. In this regard, the Project has a direct link to national and regional development efforts as it helps to promote development of Pangasinan and thereby of the regional economy.

3. SOCIO-ECONOMIC SURVEY

3.1 Regional Economic and Social Indicators

3.1.1 Regional Performance

To reiterate, the medium-term regional development plan for 1987-1992 envisions faster growth for Ilocos Region in order to reduce disparities in regional development. The region is seen to remain agricultural-oriented although, under CAIDS, a more balanced agro-industrial development strategy will be pursued.

Under this scenario, agriculture will remain as the lead sector in Pangasinan. The province is also groomed to become a leading manufacturing and trading center as well as a major exporting province. The Agno River and Allied River basins under this development framework play a significant role as a water resource base.

In recent years, however, the faster growth envisioned for Ilocos Region did not materialize. This is evident in the comparison of the region's performance from 1987-1989 vis-a-vis medium-term targets for 1987-1992. Agriculture, seen as the growth sector for the region, did not live up to its role as pacesetter.

	Ilocos Region	
Average Annual Growth Rates (%)	Medium-Term Targets 1987-1992	Performance 1987-1989
GRDP	7.4	3.1
Agriculture	5.4	0.2
Industry	10.5	7.1
Services	7.9	5.0
Population	1.9	1.9
Per Capita GRDP	5.5	1.2

Source : Medium-Term Philippine Development Plan; Medium-Term Ilocos Region Development Plan for targets. National Statistical Coordination Board for actual figures.

3.1.2 Economic Indicators

Consequently, Ilocos Region continues to lag behind in terms of economic development. This is confirmed by key economic performance measures.

(1) Gross Regional Domestic Product (GRDP)

Table 3.1 shows the GRDP of the Ilocos Region in 1989 at ₱3,388 million (constant 1972 prices) or 3.1% of the country's Gross Domestic Product (GDP). Ilocos belongs to the lagging regions along with the Cordillera Autonomous Region (CAR), Cagayan Valley, Eastern Visayas and Bicol.

The National Capital Region (NCR) is in a class by itself with a GRDP of ₱33,256 million or one-third of total domestic output. The second tier of regions with over ₱7,000 million each in GRDP are: Southern Tagalog, Central Luzon, Central Visayas, Southern Mindanao, and Western Visayas. The third tier of regions include Northern Mindanao, Central Mindanao and Western Mindanao, each with GDRP of ₱4 billion or above.

Advance 1990 estimates have the same pattern -- NCR as the richest, followed by Southern Tagalog, Central Luzon, Central Visayas, Southern Mindanao, and Western Visayas in that order. The impact of the July 1990 earthquake is apparent in the estimated 1990 negative growth rates for CAR (-4.9% to -5.2%), Cagayan Valley (-1.8% to -2.0%), and Ilocos (-1.1% to -1.3%).

Five regions posted faster growth rates than the country's GDP growth in 1990. These include: Central Luzon (3.3% to 3.5%), Western Mindanao (3.3% to 3.6%), NCR (3.6% to 3.8%), Central Visayas (3.9% to 4.2%), and Northern Mindanao (4.0% to 4.3%).

Table 3.2 provides real per capita GRDP by region. As a result of the slippage, real per capita income of the Ilocos Region is seen to slide to ₱944 in 1990 from ₱973 in 1989. The country's overall real per capita income is seen to increase slightly from ₱1,812 to ₱1,817.

(2) Regional Investment Flows

Official figures of GRDP levels broken down by expenditure shares are not available. To determine the flows of private and public investments by region, two indicators are used: (a) the cost of Board of Investments (BOI)-registered projects and (b) programmed infrastructure spending by the Department of Public Works and Highways (DPWH).

Table 3.3 shows private investments trends using BOI project costs as indicator. The high-investment regions are the NCR and Southern Tagalog. Southern Tagalog, on account of the CAvite-LAguna-BAtangas-Rizal-QueZON (CALABARZON) subregion, is shaping out as a favorite investment site in recent months.

Central Luzon and Central Visayas are also attracting considerable investment flows. Ilocos has been lagging in recent years but surged in 1990 with ₱9,293 million in planned investments. The full impact of these investments is not yet apparent in the region's economy.

Table 3.4 shows public investments as reflected in DPWH programmed spending. Here, Ilocos lags behind other regions. In 1990, it ranks second to the last among all regions with just ₱658 million in programmed infrastructure spending.

Comparison of the shares of infrastructure spending to GRDP as shown in Table 3.5 indicates that NCR and the more developed regions appear to rely less on public investments. From 1986 to 1990, the share of infrastructure spending to GRDP has ranged from 1.5% to 2.5% in Ilocos as against the national average of 0.84% to 1.19%. It can be conceded that government has attempted to spur development in depressed areas through infrastructure investments but perhaps not in the required magnitudes to lift them to "takeoff" stage.

Clearly, regions that attract private investments are also the more advanced, more developed regions and are likely to pace growth in the years to come. Southern Tagalog is expected to be a major growth region, given substantial private investments triggered off by the CALABARZON Project. Central Visayas will remain the focal point in Visayas. Central Luzon is likewise expected to benefit from growth overspill of the NCR.

It follows that Ilocos Region will continue to lag behind in economic development unless there are dramatic increases in infrastructure spending and private investments.

(3)   Regional Exports and Imports

Table 3.6   gives export earnings by region.   Ilocos posted exports of US$245 million, but this figure likely included receipts of the Baguio City Export Processing Zone (BCEPZ).   NCR expectedly led all regions in export earnings, with US$4,626 million or 59.2% of total receipts in 1989.

Similarly, in Table 3.7, NCR recorded the highest imports at US$7,538 million or 72.3% of total import disbursements in 1989.   Ilocos shipped in imports of US$207 million but again BCEPZ likely accounted for the bulk of the exports.

3.1.3   Social Indicators

The Ilocos Region's social development reflects the level of its economic development.   Selected social indicators generally show Ilocos as a relatively less developed region, although it is not in such dire state as that of Bicol or Eastern Visayas.

(1)   Demographic Indicators

Table 3.8 provides the preliminary results of the 1990 population census.   The population of the Philippines as of May 1990 is placed at 60,477,000 for a 2.3% annual growth rate since 1980.   There were about 11,380,000 households with an average size of 5.3 persons per household. The population density averaged 202 persons per km^2.

Southern Tagalog, NCR, and Central Luzon were the country's three most populated regions.   Also the three richest regions, they together accounted for more than a third of the total population.   Ilocos Region made up for some 3,548,000 or 5.9% of the country's total inhabitants. NCR posted a population density of 12,314 persons per km^2, followed by Central Luzon (340 persons per km^2), and Central Visayas (307) persons per km^2).   Ilocos Region ranked   fourth with a population desnisty of 276 persons per km^2.

The average household size for Ilocos Region is estimated at 5.4 persons/household, slightly higher than the national average. Annual population growth rate is placed at 1.9% as against the overall rate of 2.3%.

Linking the above demographic indicators with internal migration rates show population movements generally from the poorer regions to the richer regions. This is seen in Table 3.9. For 1988, the NCR posted a net inmigration rate of 5.7%. Areas with an outflow of residents are generally the poorer ones like Eastern Visayas (-5.5%) and Bicol (-3.9).

Ilocos Region exhibited a 3.1% net outmigration rate, confirming the migratory tendency of Ilocanos in pursuit of opportunities outside the region.

(2) Labor and Employment Figures

Table 3.10 shows labor and employment figures by region for 1990. NCR and Southern Tagalog have the largest labor force by region with over 3,000,000 workers each. Ilocos Region reported a labor force of 1,333,000 in 1990, of which only 121,000 were reportedly unemployed. The 9.1% unemployment rate of Ilocos approximates the overall 8.6% rate of the country.

Linking these employment figures with the population movement, it appears that outmigration somewhat eases the strains on the regional labor market.

(3) Income and Poverty Indicators

Table 3.11 gives income indicators based on the 1985 and 1988 Family Income and Expenditures Surveys (FIES). The NCR, Central Luzon and Southern Tagalog ranked among the top three with real average family incomes of ₱17,710, ₱11,106 and ₱10,068 respectively. Ilocos had a respectable ₱8,834 average family income as against the country's average of ₱9,907. The NCR, Central Luzon, and Southern Tagalog also accounted for the biggest shares of total family income. Ilocos accounted for only 5.7% and 4.9% of total family income in 1985 and 1988, respectively.

Both indicators show wide regional disparities in income. Seemingly, regional development since 1985 had not made a big impact on income distribution among regions.

Tables 3.12 provides figures on poverty incidence and subsistance incidence which show the magnitude and extent of poverty in the country. The NCR and Central Luzon had the lowest incidence of poverty at 31.8% and 39.6% respectively. Ilocos posted a 47.5% incidence of poverty, lower than the national rate of 49.5%. Based on the 1985 FIES, 24.4% of the total number of families were below the subsistence level. The NCR has a low incidence of 6% as against 15.4% for the Ilocos Region.

(4) Health and Mortality Indicators

Selected health and mortality indicators (see Table 3.13) show a general improvement in the welfare of the population. The country's average life expectancy increased from an estimated 63.1 years in 1985 to 64.0 years in 1988. Crude death rate (CDR) per 1,000 population declined from 7.9 deaths to 7.5 deaths. The infant mortality rate (IMR) per 1,000 livebirths decreased to 52.9 from 56.6 over the period.

Ilocos Region reflected this overall improvement. Life expectancy averaged 65.4 years in 1988, up from 64.5 in 1985. Over the same period, the region's CDR declined to 8.2 deaths from 8.8 deaths per 1,000 population while IMR improved from 50.7 deaths per 1,000 livebirths to 46.9 deaths. Interregional comparisons point to Ilocos as among the above average or average regions with respect to these indicators.

3.1.4 Regional Economic Structure

The level of a region's development is reflected to a large extent in its economic structure. Regions which have managed to attain a high level of industrialization -- NCR and recently Southern Tagalog, Central Luzon and Central Visayas -- tend to experience faster growth and to have a higher level of development than those regions which largely depend on agriculture.

Agriculture was and remains the main dominant activity of in the Ilocos region's economy as can be seen in the following economic structure.

Sectorial Contribution (%)	1980	1986	1989
GRDP	100.0	100.0	100.0
Agriculture	37.2	45.6	41.4
Industry	24.6	22.4	25.0
Mining and Quarrying	11.7	6.4	6.1
Manufacturing	6.4	11.8	13.3
Construction	5.5	2.9	4.2
Utilities	1.0	1.3	1.4
Services	38.2	32.0	33.6

Source: National Statistical Coordination Board

The primary sector increased its share of GRDP from 37.2% in 1980 to 41.4% in 1989. The secondary sectors which accounted for 24.6% of regional output in 1980 slipped in importance during the 1983-1985 crisis years before recovering to a 25.0% share in 1989. The services sectors accounted for the balance.

A positive development in Ilocos GRDP was that manufacturing which had a mere 6.4% share in 1980 surged strongly in recent years to account for a 13.3% share in 1989. Mining, in contrast, had steadily lost ground.

Reflecting the regional economic structure, agriculture absorbed 54.5% of total regional employment (based on 1987 figures), followed by service sectors with a 31.5% share and, lastly, industry sectors with a 14.1% share.

3.2 Socio-Economic Profile of Pangasinan

3.2.1 Resource Indicators

As explained earlier, Pangasinan is the Impact Area of the Project. Tables 3.14 to 3.16 provide selected economic and social indicators on the province. Socio-economic investigation shows the dominance of the province in the regional economy.

Pangasinan's land area totals 5,368 km^2 or 41.8% of the region's. Land use is dominated by agriculture which accounted for 2,581 km^2. This represented 66.8% of total agricultural lands in the region. Mineral reserves are abundant, particularly in silica, asbestos, kaolinitic clay and guano. These deposits are largely located in Umingan, Sison and Agno.

Infrastructure facilities are relatively developed. Pangasinan has a total road network of 4,171 km which links the major trade centers to their satellite municipalities. Each town is equipped with power and communication facilities. The province has two feeder airports (Lingayen and Rosales) and three sub-ports. However, the earthquake of July 1990 severely damaged several areas, particularly Dagupan City.

3.2.2 Production Indicators

Typical of a river basin economy, the major economic activity in the province is agriculture. Pangasinan grows paddy, corn, sugarcane, vegetables (particularly mongo, tomatoes, onions), tobacco, cotton and others. Table 3.15 provides output figures. In 1988, it contributed 58.6% of the paddy output and 68.2% of corn production in the region. Major agricultural areas are in the lowlands along Agno River and the Allied Rivers in central and northwestern Pangasinan.

Livestock and poultry production thrives both in backyard and commercial scales. Meat production of carabeef, beef, chevon and pork totaled 14,548 metric tons (MT) in 1988 which represented about a third of the region's output. The province is likewise a major producer of poultry and eggs. It had the largest animal population in the region with a total headcount of 3,720,925, of which poultry accounted for 77.6%.

Trading in agriculture produce accounted for the emergence of the cities of Dagupan and San Carlos and the towns of Urdaneta, Villasis, Alaminos, and Rosales (Carmen) as commercial centers.

Marine and inland fisheries is another major activity. In 1988, Pangasinan accounted for 45,069 MT or 89.5% of the region's fisheries production. Major fishing grounds are Lingayen Gulf, Tambac Bay, Sual Cove, Dasol Bay and Lucap Bay.

Fishpond development has thrived in the deltas of Agno, Balincaguin and Bued rivers. Dagupan City is reputed for its Bonoan milkfish ("bangus"). The province has two major fishing ports where commercial vessels unload their catch, Sual and Dagupan City. The fishing port complex in Sual is expected to develop into a major fish storage and processing center.. Fish trading towns are Bayambang, Alaminos and Rosales. Fish processing, consisting largely of smoked fish and fish sauce fermentation, is a flourishing industry in the western Pangasinan.

Mineral production was valued at ₱211 million in 1989, accounting for 70.8% of region's output. These are mostly nonmetallics such as salt and limestone.

Clearly, Pangasinan's economy is largely agricultural and extractive-based. Supplementary information from development plans and socio-economic profiles reveal that it has a relatively modest industrial base, mostly small-scale and cottage industries. These are largely engaged in bamboocraft, shellcraft, rattan craft, ceramics manufacturing, furniture-making, metalcraft, and garments manufacturing.

Agro-based establishments are largely engaged in rice milling, feed milling, and salt-making. The only manufacturing centers of note are Dagupan City (fish processing), San Carlos City (tomato paste and mango puree processing) and Sual (fish processing).

3.2.3 Social Indicators

Table 3.16 gives social indicators for the province.

In population size, Pangasinan is again dominant with 2,018,000 or 56.9% of the region's population in 1990. It actually ranks third, behind Cebu and Negros Occidental, among the country's top five provinces in terms of population. With respect to population density, Pangasinan is higher than the region.

The province's work force numbered 699,000 in 1989 or 53.5% of the region's workers. The LFPR is estimated at 60.1% while the employment rate is placed at 95.6%. Agriculture absorbed the bulk of the labor force.

Based on the 1985 FIES, average family income is estimated at ₱29,243, lower than that of the regional average. La Union and Ilocos Norte posted higher average family incomes at ₱36,669 and ₱33,484, respectively. One causal factor is the high proportion (70.6%) of families deriving income from primary sources in Pangasinan. The urban-rural index of income disparity confirms this observation.

In terms of health and mortality indicators, the province is generally at par with the region. The figures reflect a satisfactory standard of living.

3.2.4 Summary

In summary, the above indicators give the following profile for Pangasinan:

(i) An economy which is dependent on agriculture and fishing but is fairly diversified and possesses strong potentials for agro-based industrialization.

(ii) A populous province which relies mainly on the primary sector to absorb labor but has substantial and growing secondary and tertiary sectors.

(iii) A largely rural society with emerging urban centers.

(iv) A society still dependent on farm incomes but which manages to achieve a satisfactory standard of living.

Table 3.17 shows that the settlements within the defined project beneficial areas are largely agricultural. The major crop is mainly paddy, both irrigated and rainfed. Likewise, aquaculture and fishpond development appears to be focused in the river delta areas near Dagupan City. In this regard, the beneficial areas are largely dependent on the agriculture sector and should have socio-economic conditions similar to Pangasinan and to the regional economy as described above.

4. PROJECTIONS OF SOCIO-ECONOMIC CONDITIONS

4.1 Implications of Economic Stabilization Program, 1991-1992

There is need to assess the impact of recent events in order to put the socio-economic projections on objective basis. These events include the deterioration of the macroeconomy and the July 1990 earthquake.

Table 4.1 provides selected macroeconomic indicators. Coming out of the 1983-1985 crisis, the overall economy enjoyed four straight years of satisfactory growth. From a negative 4.1% in 1985, real Gross National Product (GNP) growth turned positive at 1.9% in 1986. Recovery continued through the next three years, with real economic growth of 5.9% in 1987, strengthening at 6.7% in 1988 before falling to 5.7% in 1989. Growth averaged 6.1% annually from 1987 to 1989 as against the medium term growth target of 6.7%.

The economic situation dramatically changed in 1990 when macroeconomic imbalances such as high budget deficits and foreign exchange scarcity reemerged. This was exacerbated by the prolonged drought in April-May, the July killer earthquake and the destructive Ruping typhoon in November, and the outbreak of the Gulf crisis towards the end of the year. The advance estimate for real GNP growth in 1990 is placed at 3.1%, definitely a far cry from the medium-term target of 6.7%.

In view of the new circumstances, the GOP has submitted an Economic Stabilization Program for 1991 and 1992 in a Letter of Intent (LOI) to the International Monetary Fund (IMF). The stabilization program features: reduction of the fiscal deficit, prudent control of money supply growth, competitive exchange rate, and continued commitment to undertake structural reforms. The program was approved by the IMF in late February 1991.

Authorities expect the economy to remain stagnant in 1991 before recovering in 1992. Advance estimates for the first quarter 1991 appear to confirm this slowdown scenario as GNP posted a mere 0.19% growth. The violent eruption of Mt. Pinatubo in June 1991 further dampened the near-term prognosis. The country's goal to gain full economic recovery is likely to be set back by a full two to three years as well as the goal to achieve NIC status by another decade.

Growth targets for the country have been drastically downscaled.

Sector Growth (%)	1990	Projections 1991	1992	1st Quarter 1991
Gross National Product	3.1	1.5-2.5	4.0	0.19
Gross Domestic Product	2.5	1.8	3.8	0.20
By Industrial Origin				
Agriculture, Fishery and Forestry	2.2	2.8	4.4	4.6
Industry	1.9	(0.1)	3.7	-4.4
Mining and Quarrying	2.5	(1.6)	0.6	-7.2
Manufacturing	1.4	0.9	3.5	1.0
Construction	4.2	(5.2)	5.3	-29.9
Services	3.3	2.8	3.4	1.9

Source: National Planning and Policy Staff, National Economic and
Development Authority

Likewise, Gross Regional Domestic Product targets for 1991 and 1992
have been revised.

Gross Regional Domestic Product (%)	Estimate 1990	Projections 1991	1992
Overall Philippines	2.5	1.8	3.8
NCR	3.6-3.8	3.3-4.4	4.8-5.9
CAR	(5.2-4.9)	1.6-2.7	1.8-2.9
Ilocos	(1.3-1.1)	1.5-2.7	1.8-2.9
Cagayan Valley	(2.0-1.8)	1.6-2.7	1.8-2.9
Central Luzon	3.3-3.5	2.9-4.1	3.8-4.9
Southern Tagalog	2.6-2.9	1.7-2.8	2.0-3.0
Bicol	2.1-2.4	1.4-2.5	1.7-2.8
Western Visayas	2.9-3.1	1.9-3.1	2.8-3.9
Central Visayas	3.9-4.2	3.8-5.0	4.8-5.8
Eastern Visayas	2.7-3.0	0.7-1.8	1.1-2.1

Gross Regional Domestic Product (%)	Estimate 1990	Projections 1991	1992
Western Mindanao*	3.3-3.6	2.5-3.7	3.0-4.1
Northern Mindanao	4.0-4.3	2.9-4.1	3.0-4.1
Southern Mindanao	2.3-2.5	1.2-2.4	1.4-2.5
Central Mindanao*	2.7-2.9	1.9-3.1	2.0-3.1

* Includes the Autonomous Region of Muslim Mindanao (ARMM)

Source: National Planning and Policy Staff, National Economic and
    Development Authority

It can be seen that the regions heavily ravaged by the July earthquake will continue to suffer from the adverse effects in the short term. GRDP for CAR, Cagayan Valley and Ilocos Region will barely reach 3% in the next two years.

The Ilocos region in particular will need ₱3.2 billion out of total ₱7.0 billion estimated for repair and rehabilitation of earthquake-damaged infrastructures (see Table 4.2). The estimates for Pangasinan and the cities of Dagupan and San Carlos are placed at ₱2.1 billion. NEDA expects the rehabilitation efforts to peak during the 1990-92 period, and reconstruction to intensify up to 1995.

4.2 Socio-Economic Projections for the Region

4.2.1 GDP and GRDP Projections

For 1991 to 1992, an economic slowdown is likely for Ilocos Region and probably for Pangasinan. As the national economy pursues a short-term stabilization program to steer itself back into a sustainable growth path, the region and the province will have to undertake reconstruction of earthquake-ravaged areas. The development objectives set by NEDA are to: (a) bring the economy back to its pre-quake situation; (b) ensure that the capacity of the region to withstand similar disasters is set in place; and (c) stimulate the growth momentum to catch up on lost time.

Beyond 1992, official projections for the GDP and GRDP are not available. In the light of recent developments, the high growth scenario adopted in the Interim Report appears optimistic. The earlier projections must be modified.

Recovery after 1992 will hinge on the success of both the economic stabilization program and the earthquake reconstruction work. But forecasts cannot be too optimistic. Recent experience shows that it takes time before structural adjustment reforms take root and show their full impact on the overall economy.

The trend growth rates are presented for different time periods: (a) modest growth (1975-1980); (b) contraction (1981-1985); (c) recovery (1986-1989); and (d) incipient slowdown (1990-1992). It can be seen that, despite structural reforms since 1986, GDP growth in recent years never duplicated the performance of the late seventies.

Trend Growth Rate (%)	Philippines GDP	Ilocos GRDP
Actual Growth for the Period		
Modest Growth (1975-1982)	5.4	5.2
Contraction (1982-1985)	(3.2)	0.1
Recovery (1985-1989)	4.5	4.1
Slowdown (1989-1992)*	2.7	1.1
Trend Growth (Compound Growth Rate)		
1975-1992*	3.2	3.3
1987-1992*	4.1	2.2
High Growth Scenario (Used in Interim Report)		
1992-2000	6.8	5.2
2000-2010	7.6	5.6
Modified Growth Scenario		
1992-2000	5.1	4.3
2000-2010	5.9	4.6

* Incorporates projections for 1991 and 1992

Source: National Income Accounts, National Statistical Coordination Board for actual growth rates. Note that GRDP figures from 1975-1987 include Abra, Benguet, and Mt. Province.

This suggests the need for a long-term perspective that includes periods of expansion and contraction in making the socio-economic projections.

In this regard, the long-term trend growth rate for 1975-1992 was computed. This is placed at 3.3% and 3.2% for GDP and Ilocos GRDP, respectively (see Table 4.3). The figures represent the long-term growth of the economy, with short-term fluctuations smoothened out.

Figure 4.1 shows the trendline based on this long-term growth vis-a-vis the trendline based on the high growth scenario of NEDA. The latter represents robust economic expansion, assuming the economy adjusts fully to structural reforms. The midpoint between the two trends is proposed to be used in the socio-economic projections as being reflective of a more realistic growth scenario.

The "modified growth" scenario shows GDP growth rates of 5.1% for the 1992-2000 period and of 5.9% for the 2000-2010 period. Under this scenario, GRDP for Ilocos Region is projected to grow at 4.3% for the 1992-2000 period and at 4.6% for the 2000-2010 period.

The projections are summarized below and shown in detail in Table 4.4.

Growth Projections (Million Pesos)	1990	2000	2010
GDP at constant			
1972 prices	109,890	172,630	305,876
1990 prices	1,129,817	1,774,861	3,144,803
GRDP at constant			
1972 prices	3,349	4,891	7,662
1990 prices	34,419	50,288	78,772
*Growth in Price Deflator (1990/1972) = 10.2813			

4.2.2 Projections on Economic Sectors

The official GRDP projections are not broken down by industrial origin. Projections of the economic structure is therefore based on the development scenario envisioned for Ilocos Region.

Given the thrust of CAIDS towards balanced agro-industrial development, it is probable that the regional economic structure of Ilocos by year 2010 will approximate the current economic structure of the country as present.

This scenario implies that the pace of industrialization will quicken in the region. The share of agriculture to the regional output will increasingly decline. In the near and medium term, agriculture will likely remain the lead sector to stimulate and support development. In time, this will give rise to rural-based industries.

In the longer term, industry particularly manufacturing will contribute greater shares. Agro-based and aqua-based industries should grow stronger. Industrialization will also accelerate the shift towards the service sectors. The scenario becomes more probable if the region pushes the envisioned transformation of Pangasinan into a primary manufacturing and trading center and a major exporting province.

If this scenario occurs, the economic structure of Ilocos Region in broad terms will see a shift from a largely agriculture-based towards a more industrialized and service-oriented economy. This will take a long time and will hinge on consistent efforts to promote CAIDS.

The downside risks will occur if Ilocos Region perpetually regards itself as a mere supplier of raw materials and agricultural produce and therefore does not strive to promote and develop its own manufacturing and processing sectors as envisioned under CAIDS.

Economic Structure	1990	2000	2010	Implied Growth (%)
(In Million Pesos)				
GRDP at constant 1972 prices	3,349	4,891	7,662	4.7
Agriculture	1,373	1,663	2,069	2.3
% share	41.0	34.0	27.0	
Industry	837	1,418	2,528	6.3
% share	25.0	29.0	33.0	
Services	1,139	1,810	3,065	5.7
% share	34.0	37.0	40.0	

* Assumptions: (1) Economic structure in 1990 approximates that of 1989. (2) Economic structure in 2010 approximates that of the country's 1990 structure. (3) Economic structure in 2000 is derived as the midpoint value.

4.2.3 Investment Projections

Investment projections are based on the concept of Incremental Capital Output Ratio (ICOR), using the above GDP and GRDP projections. In layman's terms, ICOR means the required additional units of capital that must be invested to produce one additional unit of output. This is computed as the average of current and previous year's ratios of total investments to GNP divided by current year's growth rate.

In the Philippines, ICOR has been placed at roughly 4:1 which approximates most less developed countries (see Table 4.5). That is, it takes an incremental investment of ₱4 to produce ₱1 of incremental output. Given an ICOR of 4:1 and a projected GDP growth rate of 5%, the proportion of investments or Gross Domestic Capital Formation (GDCF) to GDP must be roughly 20%.

Regional ICOR figures cannot be estimated since there is no official breakdown of GDRP by expenditure shares. Some regions will be relatively more efficient than other regions in utilization of investment resources and should therefore have a lower ICOR. Owing to the lack of regional ICORs, the estimated ICOR for the whole economy is used for Ilocos Region.

Given the above parameters, Tables 4.6 and 4.7 provide the investment magnitudes for GDP and GRDP, respectively. A steadily increasing capital-output ratio from 20% to 24% is apparent unless the economy becomes more efficient in the use of investment resources.

The same tables also give the required order of magnitudes of private and public investments. The assumed 15.5% share of government investments to total investments is based on historical patterns. Less developed regions would likely have higher shares of government investments to total investments.

It follows that, for Ilocos Region to achieve the expected growth rates, it must sustain a 17%-18% ratio of investments to GRDP. More investments must flow into the region. As private investments are just coming in, the government needs to step in. Doubling or trebling the ratio of infrastructure spending to GRDP from the current 1.5%-2.0% levels to 3.0%-4.0% will have a dramatic impact on regional economy.

4.2.4 Population Projections

The preliminary 1990 census estimated population growth for Region I and Pangasinan at 1.9% and 2.1%. respectively, over the 1980-1990 period. Comparison of the census estimates with the population projection of NEDA (using the medium assumption of moderate fertility decline and moderate mortality decline) that the latter projections are generally accurate and are appropriate for use in the socio-economic projections.

The regional population is projected to reach 4,140,000 in 2000 and 4,662,000 in 2010. Pangasinan's population is projected at 2,255,000 by 2000 and at 2,506,000 by 2010. Table 4.6 gives the population projections for the municipalities in greater detail.

Population (In thousand)	1990 Census Estimate	Medium Assumption Projection		
		1990	2000	2010
Ilocos Region	3,548	3,514	4,140	4,662
Ilocos Norte	468	463	541	606
Ilocos Sur	520	540	652	752
La Union	549	569	692	798
Pangasinan	2,018	1,942	2,255	2,506

Source: National Statistics Office for 1990 census estimates; National Economic and Development Authority for population projections.

4.2.5 Quality of Life

"Per capita GDP" can be used as indicator to reflect the living standard of a given area. The higher the per capita GDP in a given area, the more likely each person will have higher purchasing power and will have better access to social services. Economic growth presumably brings about an increase in income and thereby an improvement in the quality of life.

The indicator has a limitation in the sense that it does not and cannot capture the redistributive effects of growth. In this qualified sense, the quality of life in the region is reflected in the per capita GDP levels and growth as seen below.

Per Capita GDP Projections	1990	2000	2010	Implied Growth (%)
GRDP at constant 1972 prices (Million Pesos)	3,349	4,891	7,662	4.2
Population (In thousand)	3,548	4,140	4,662	1.5
Per Capita GDP	943	1,185	1,644	2.8

With GDP growth outpacing population increases, there will be higher per capita GDP and presumably improved standard of living in Ilocos.

4.3 Socio-economic Projections for Pangasinan and Beneficial Area

4.3.1 "What-If" Cases for GDP Projections

The above socio-economic projections apply also to the Pangasinan as well as the project beneficial areas as these have basically similar socio-economic conditions. Hence, the pace of regional growth, the shift in economic structure, the investment magnitudes, the population increases, and the increase in per capita income as projected above should also be reflective of conditions in these areas.

If at all there will be marked differences, it will be because Pangasinan is expected to remain as the pacesetter in the Region. It is more likely than not for Pangasinan to have relatively faster economic growth, more rapid industrialization, greater investment requirements, higher population increases and higher standard of living than other provinces in the Region.

Two "what-if" cases are proposed to estimate gross domestic output of Pangasinan and of the beneficial areas:

(i) the use of per capita GRDP as projected above, and

(ii) the use of a per capita GRDP figure higher by 15% to reflect role of Pangasinan as the "pacesetter" province.

The 15% factor is deemed conservative since this implies a 4.7% growth in Pangasinan's GDP as against the projected 4.2% growth in Ilocos GRDP. The estimates must be taken as broad magnitudes, not as precise estimates, given the dynamic interplay between population growth and economic growth.

The area GDP levels of each scenario are summarized below:

Base Case	1990	2000	2010	Implied Growth (%)
Per Capita GDP	943	1,185	1,644	2.8
Population (In Thousand)				
Pangasinan	2,018	2,255	2,506	1.1
Beneficial Areas	991	1,152	1,283	1.3
GRDP at constant				
1972 prices (In Million Pesos)				
Pangasinan	1,903	2,672	4,120	3.9
Beneficial Areas	935	1,365	2,109	4.2

*   Assumptions: (1) Per capita GDP based on projections
for the   region; (2) Population projections based on NEDA
medium   assumption projections.

Higher Growth Case	1990	2000	2010	Implied Growth (%)
Per Capita GDP*	943	1,362	1,891	3.5
Population (In Thousand)				
Pangasinan	2,018	2,255	2,506	1.1
Beneficial Areas	991	1,152	1,283	1.3
GRDP at constant				
1972 prices (In Million Pesos)				
Pangasinan	1,903	3,071	4,739	4.7
Beneficial Areas	935	1,569	2,426	4.9

*   Assumptions: (1) Per capita GDP higher by a factor of
15%   than the regional average in line with Pangasinan's
"pacesetter"   role; (2) Population projections based on NEDA
medium assumption projections.

The latter scenario is considered more plausible and more consistent
with the defined development role of Pangasinan.

4.3.2 Investment Projections

Taking the latter scenario as basis for projecting investments
requirements, it appears that Pangasinan must capture greater shares of
investment flows to attain the desired growth.   Based on BOI project costs,

actual investments appear to be running well ahead of investment targets set by DTI for the 1988-1992 period. Private investments, a trickle in the early recovery years, surged dramatically in the last two years. However, the full impact of these planned investments is not yet apparent in the local economy.

Private Investments in Pangasinan	Target	Actual
(In Thousand Pesos)		
1987		21,520
1988		71,390
1989	285,000	1,081,318
1990	266,000	7,801,867
1991	716,000	
1992	687,000	

Source: Department of Trade and Industry for target levels; Board of Investments for actual figures.

On the other hand, infrastructure spending must also be increased. Table 4.9 illustrates the desired infrastructure budget for Pangasinan to support the projected GRDP growth, based on the following assumptions: (a) Ilocos infrastructure spending at 3.5% of projected GRDP; (b) share of Pangasinan to regional infrastructure spending at 50% and (c) sectoral allocation on flood control and drainage works at 25% of Pangasinan's infrastructure budget. If allocations for infrastructure particularly flood control are increased, the benefits to and impact on the province's socio-economy will be tremendous.

5. ESTIMATION OF PROJECT BENEFITS

5.1 General

Figure 5.1 provides a framework for benefit analysis of a flood control project. There are two types of flood control benefits: (a) direct benefits stemming from reduction or prevention of flood damages (deterrent effects); and (b) benefits arising from positive effects of flood control.

Direct benefits refer to prevention or reduction of direct and indirect damages due to flood. Direct damage consists of: (a) agricultural damage to crops, livestock and aquaculture; and (b) non-agricultural damage due to houses, buildings and infrastructures. Indirect damage arises from suspension of economic activity; additional transport expenditures owing to traffic blockades; and costs of rescue and relief activities. Flood damage analysis provides a quantification of these benefits.

Other benefits also arise as a result of flood control. Acting as a growth catalyst to reinforce the development process in a given area, flood protection has beneficial effects. In the short run, these include: (a) land enhancement; (b) greater agricultural production; and (c) improved agricultural productivity. Long run effects include: (d) development of agro-industries and aqua-based industries; (e) changes in economic structure and employment structure; (f) increase in per capita income and consumption; and (g) improvement in quality of life. These effects can be attributed to flood protection in the sense that it makes possible, enhances, or accelerates their occurrence or development.

The benefits from these effects are difficult to quantify. Lack of time series data prevents use of correlation analysis to test the cause-and-effect relationships and to come out with estimating equations. In this regard, two methods have been tried to estimate other benefits: (a) Input-Output (I/O) analysis, and (b) "What-if cases". I/O analysis attempts to show the impact, particularly the linkage effects, of an infrastructure project like flood control. "What-if" cases use simplifying assumptions to quantify several effects of flood control. The results are not intended to

give precise figures but to come out with orders of magnitudes. Their
utility lies in showing that the contribution and impact of flood control to
socio-economic development is significant.

5.2 Estimation of Direct Benefits

5.2.1 Results of Flood Damage Analysis

Flood damage analysis estimates the probable flood damages in the
maximum inundation areas for flood frequencies of 1.05, 2, 5, 10, 25, 50,
and 100 years. The amount of damages which can be prevented by structural
measures constitute the direct benefits of flood control.

	Probable and Annual Average Flood Damages (In Million Pesos)			
Return	Upper Agno		Pantal-Sinocalan	
Period	Probable	Annual Average	Probable	Annual Average
(Year)	Flood Damage	Flood Damage	Flood Damage	Flood Damage
1.05	101.0	0.0	0.0	0.0
2.00	250.0	79.1	501.0	113.2
5.00	705.0	222.7	791.0	307.5
10.00	1,196.0	317.6	985.0	396.1
25.00	1,579.0	400.9	1,206.0	461.3
50.00	1,976.0	436.3	1,509.0	488.5
100.00	2,277.0	457.7	1,706.0	504.4

Source: Flood Damage Analysis Report, 1991.

	Annual Average Flood Damages By River Basin (In Million Pesos)				
Return	Upper Agno			Pantal-Sinocalan	
Period	Upper	Pantal-	Cayanga-		
(Year)	Agno	Sinocalan	Patalan		Total
1.05	0.0	0.0	0.0	0.0	0.0
2.00	54.0	20.5	4.5	113.2	192.2
5.00	104.9	100.2	17.5	307.5	530.1
10.00	126.7	164.4	26.4	396.1	713.7
25.00	142.6	224.7	33.5	461.3	862.1
50.00	148.5	251.4	36.3	488.5	924.7
100.00	151.9	267.8	37.9	504.4	962.1

Source: Flood Damage Analysis Report, 1991.

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The annual average flood damage is estimated at ₱457.7 million and ₱504.4 million in 1989 prices for the Upper Agno and the Pantal-Sinocalan basins, respectively, or an aggregate of ₱962.1 million for the two basins. In a 10-year flood return period, the cumulative annual average flood damages are placed at ₱317.6 million and ₱396.1 million from Upper Agno and Pantal-Sinocalan basins, respectively, or some ₱713.7 million for both basins.

5.2.2 Adjustments of Benefit Flows

The above magnitudes are the maximum benefits obtainable on the basis of flood damage analysis. Adjustments, however, have to be made to reflect project design conditions.

First, the use of Poponto swamp as a retarding basin will result in greater flooding and widen the inundation area from 124 km^2 under present conditions to 203 km^2. This will adversely affect a higher number of people and properties (see Section 7.2 for the discussion on Social Costs) and reduce the benefits derived in the flood damage analysis for the Upper Agno project. The reduced ("negative") benefits is estimated at ₱81.3 million under a 10-year flood design condition. Damage to buildings and infrastructures could be controlled or recovered by countermeasures (e.g. protection levees, heightening of roads, etc.). Intermittent flooding, however, of agricultural land and fishponds will lead to loss of output valued at some ₱34.2 million or 42% of the estimated negative benefits. Adjusted for this, net benefits for the Upper Agno project are placed at ₱283.4 million.

Adjustments of Benefit Flows (P'000,000)		
	Upper Agno	Pantal-Sinocalan
Expected Benefits based on Flood Damage Analysis	317.6	396.1
Reduced Benefits due to Project Design Conditions	34.2	188.5
Net Benefit Flow	283.4	207.0

Second, the river improvement component of the Pantal-Sinocalan project extends only up to Urdaneta at its easternmost end and does not include the upper reaches of Ingalera, Macalong, Tagamusing, and Tuboy rivers. Based on block assessment, the Pantal-Sinocalan benefit flow is estimated to go down from ₱396.1 million to ₱207.0 million.

In summary, the adjusted benefit flows come to ₱283.4 million and ₱207.0 million for the Upper Agno and Pantal-Sinocalan projects, respectively, or some ₱582.4 million for the two projects.

5.3 Estimation of Linkage Effects through Input-Output Analysis

5.3.1 Comparative Ratios and Indices of Industry Sectors

In the I/O approach, flood control works are regarded as infrastructure activities which are captured under "construction sector" or Sector 46 of the 66x66 matrix of the Input-Output Tables (1983 update). Examination of the inter-industrial relationships of construction reveals the linkage effects of a infrastructure project like flood control.

Table 5.1 provides the productivity ratios and the degree of forward and backward linkages of all industry sectors as derived from the 66x66 matrix. This is to indicate a sector's relative importance in the economy. The productive capacity (i.e. capacity to generate income) of a sector is measured by the ratio of its gross value added to the value of produced or intermediate inputs it uses. The extent of forward linkages shows a sector's importance as a supplier of raw materials and inputs; this is measured by means of the sensitivity index. The extent of backward linkages reveals its importance as a purchaser of raw materials; this is measured through the power of dispersion index

Based on the transactions matrix of the I/O tables, the construction sector generates income of ₱1.1452 for every ₱1 of intermediate inputs. Based on the inverse matrix, the sensitivity index is lower than unity at 0.6248, indicating most of its output goes to final demand (that is, demand by households, government, investment, and foreign sectors). The power of

dispersion index determining the extent of backward linkage is slightly higher than unity at 1.0026. This means it is a significant user of intermediate inputs but not as substantial as other sectors.

5.3.2 Interdependence of the Construction Sector

The inverse coefficients also indicate the interdependence of the industry sectors. They show the direct and indirect effects on the output of the sector per unit increase in final demand. Table 5.2 gives the inverse coefficients of the construction sector.

Aside from itself, the top ten sectors with which the construction sector has strong direct and indirect forward linkages are as follows:

No.	Sector	Forward Linkage Inverse Coefficients
46	Construction	1.0051389
12	Non-Metallic Mining and Quarrying	0.0169428
60	Real Estate and Ownership	0.0120229
65	Other Private Services	0.0118756
37	Petroleum Products	0.0099167
04	Sugarcane	0.0092281
58	Wholesale and Retail Trade	0.0080605
38	Cement Manufactures	0.0076568
03	Corn	0.0073314
29	Paper and Paper Products	0.0069918
47	Electricity	0.0068821

Source: Input-Output Tables (1983 Update).

The top ten sectors with which construction, aside from itself, has direct and indirect backward linkages are as follows:

No.	Sector	Backward Linkage Inverse Coefficients
46	Construction	1.0051389
40	Basic Metals	0.1519037
37	Petroleum Products	0.1012687
58	Wholesale and Retail Trade	0.1010871
26	Lumber, Plywood and Veneer	0.0862540

No.	Sector	Backward Linkage Inverse Coefficients
12	Non-Metallic Mining and Quarrying	0.0793921
41	Metal Products	0.0592481
10	Forestry and Logging	0.0528918
39	Other Non-Metallic Mineral Products	0.0402920
38	Cement Manufactures	0.0391879
43	Electrical Machinery	0.0338478

Source: Input-Output Tables (1983 Update).

As added information, the forward-backward linkages of construction with ten sectors seen to be of significance to Pangasinan's river basin economy is given below.

No.	Sector	Forward Linkage Coefficients	Backward Linkage Coefficients
01	Palay	0.0010214	0.0002964
02	Corn	0.0073314	0.0002237
06	Other Crops	0.0046815	0.0025726
08	Poultry/Poul Products	0.0040692	0.0007823
09	Fishery	0.0013442	0.0015822
13	Rice/ Corn Milling	0.0015811	0.0005112
52	Road Freight Trnsport	0.0036520	0.0185106
58	Wholesale/Retail Trade	0.0080605	0.1010871
60	Real Estate/Ownership	0.0120229	0.0028876
64	Hotels/ Restaurants	0.0057573	0.0039968

Source: Input-Output Tables (1983 Update).

It can be seen that construction has strong forward linkage with real estate and ownership (sector 60) and corn (sector 02). On the other hand, it has strong backward linkage with wholesale and retail trade (sector 58) and other crops (sector 06).

5.4 "What-If" Cases for Estimation of Other Benefits

Quantification of some of the other flood control benefits have been tried by use of simplifying assumptions, that is, "what-if" cases.

5.4.1 Land Enhancement

Flood-prone areas have opportunity costs equivalent to the value of net output foregone as a result of flooding. This is reflected in a lower market value for these areas as against those in flood-free areas. With flood control, the land could now be put to its best use. For example, flood-prone areas in the urban cores could be used for commercial or residential purposes. Those in the urban fringes could be turned into industrial use. Farmlands could be cultivated more intensively or even transformed into other land uses. This leads to appreciation of land values which in turn results in a bigger tax base for the local government.

As a concrete example, the Manggahan experience can be cited. The 10-km Manggahan Floodway acts to divert the floodflows of Marikina River at Barangay Manggahan, Pasig to Laguna de Bay and thereby to relieve flooding of Pasig and its environs. While the floodway was being constructed, land prices in areas adjoining it increased by 16% to 38% annually over a 10-year observation period. Although such appreciation is due to a host of factors, flood protection can be reasonably cited as the critical factor that sparked the price changes.

Impact of Flood Protection on Land Values: Manggahan Experience			
Land Values (P/sqm)	Before Proj (c1980)	After Proj (c1990)	Appreciation Rate (%)
Commercial	250	5,000	35
Residential,developed	150	1,200	23
Residential,undeveloped	70	320	16
Farmland (all types)	10	250	38
Others (e.g. road lot)	30	500	32

Source: Manggahan Floodway Project Office

This is expected to happen in Pangasinan where land values had historically grown by roughly 15% annually or doubling every five years. With the implementation of the flood control projects, land values should appreciate dramatically. Specifically, the Dagupan bypass project should enhance the land values of commercial and residential areas in the Dagupan City- Calasiao- Sta. Barbara corridor along the Marusay-Sinocalan rivers. Channel improvements of the minor rivers should lift land values in San Carlos City, Malasiqui and Urdaneta. Meanwhile, the Upper Agno project is likely to increase market values of farmlands along the river stretches and in lowlying areas of the Allied river basin.

Given the impossibility of isolating the impact on land values of flood control from other factors, quantification of the land enhancement benefit is difficult. For purposes of this "what-if" exercise, actual transaction prices of land in the project beneficial areas are compared with appraised commercial values, as gleaned from compensation cost estimates. The difference constitutes the incremental land appreciation that could stem from the implementation of flood control projects. That is, flood protection would either encourage property owners to put their real estate holdings to best use or impel them to declare the true market values for right-of-way compensation purposes. Either way, there is an appreciation of land values.

Comparison of Transactions Prices and Appraised Values (₱/sqm)			
Land Values	Transactions Prices	Appraised Prices	Incremental Prices
Urban Commercial/			
Residential	400.00	60.00	340.00
Settlements	80.00	20.00	60.00
Farmland			
Irrigated Paddy	14.00	1.80	12.20
Rainfed Paddy	10.00	1.50	8.50
Other Crops	5.00	1.20	3.80
Fishpond	30.00	3.00	27.00
Others	8.00	1.50	6.50

Source: Compensation Cost Estimates

Application of the incremental land prices to the river basin area indicates a potential value increase in the order of ₱16.4 billion (see Table 5.3). Even if such appreciation takes 20 years, the increase in land values comes to some ₱818 million annually.

Potential Land Appreciation (₱'000)				
Land Use Type	Upper Agno	Pantal-Sinocalan	Cayanga-Patalan	Total
Urban Commercial/				
Residential		10,064		10,064
Settlements	43,200	208,416	49,080	300,696
Farmland				
Irrigated Paddy	31,732	72,584	22,643	126,959
Rainfed Paddy	17,799	125,796	17,153	160,748
Other Crops	6,563	17,824	4,074	28,460
Fishpond	378	68,175	1,917	70,470
Others	11,986	80,287	28,535	120,808
Total	111,658	583,146	123,402	818,206
Average Increase per Hectare (₱)	6,203	6,658	6,034	6,492

The price per ha goes up by an average of ₱6,492/ha, with areas within the Pantal-Sinocalan basin exhibiting the biggest average increase at ₱6,658/ha. This is not unexpected as the Pantal-Sinocalan basin includes Dagupan City and San Carlos City, where prime commercial areas and most of the irrigated farmlands and fishponds can be found. The two other river basins cover mostly agricultural land.

5.4.2 Greater Agricultural Production

Peculiar to a river basin economy like Pangasinan's, flood protection will make possible more extensive cultivation of arable land. Flood control protects such rural infrastructures as farm-to-market roads, irrigation channels, public markets, etc., all of which have been observed to have positive correlation with farm production. Flood protection also safeguards against floods that often wash away topsoil of farmlands.

Aside from this preventive or deterrent effect, flood control stops overtopping and allows farmers to improve the drainage conditions of their farms. This will have the following impact. First, areas previously subject to floods or to waterlogging even during dry season could now be planted. Second, farmlands within the service area of existing irrigation systems but remaining still unirrigated could be irrigated. In this regard, flood protection leads to an expansion in arable or irrigable land and thereby to an increase in farm production.

As a case in point, the potential increase in irrigated area due to flood protection is considered. Freed from the threat of floods, farmers and irrigation officials are likely to take steps that will enhance water flow of irrigation systems, expand their reach and allow year-round irrigation. These actions can include desilting activities, improvement of drainage, and proper maintenance of irrigation facilities.

Several national irrigation systems straddle the Impact Area: (a) Agno River Irrigation System; (b) Lower Agno-Totogonen River Irrigation System; (c) Sinocalan River Irrigation System; (d) San Fabian-Dipalo Irrigation System, (e) Ambayaoan-Dipalo Irrigation System, and (g) Camiling River

Irrigation System.   These have an aggregate service area of 46,820 ha.
Communal irrigation systems within the feasibility study area add another
26,065 ha (see Table 5.4).

Figures shown below indicate that actual irrigated area is way below
the service area.   Irrigation intensity varies in view of fluctuation of
river discharges, silting problems, disuse and other reasons.

Status of Irrigation Development in Feasibility Study Areas

	Total	Actual
Service Irrigation Area (ha)		
National Irrigation Systems	46,820	21,284
Communal and Pump Irrigation Systems	26,065	23,609
Total	72,885	44,893
Potential Irrigable Area		27,992

Source: City and Municipal Profiles, 1989, Department of Agriculture
          Pangasinan Irrigation Profile, 1989, National Irrigation
          Administration

For this "what-if" exercise, it is assumed that flood protection allows
the potential irrigable area of 27,992 ha to be tapped and at least 25% is
put to productive use annually.   The boost to farm production and rural
incomes would be substantial.   Based on assumptions of flood damage
analysis, an ha of irrigated paddy land can yield 4.5 metric tons (MT) of
rice and generate net income of ₱8,795.   This translates to some 125,964 MT
in additional paddy output and ₱246 million incremental income.

Potential Increase in Farm Production and Income				
	Upper Agno	Pantal-Sinocalan	Cayanga-Patalan	Total
Actual Irrigated Area (ha)	5,202	11,899	3,712	20,813
Potential Irrigable Area (ha)	6,996	16,003	4,992	27,992
Net Farm Income (P'000)	61,533	140,749	43,905	246,190
Annual Incremental Net Income (P'000)	15,383	35,187	10,977	61,547

It is further assumed that the additional hectarage is apportioned to each river basin in relation to its actual irrigated area. Again, the Pantal-Sinocalan basin will benefit greatly from the flood protection afforded to irrigation as it has 57% of irrigated land.

5.4.3   Increased Farm Productivity

By the same token, flood protection leads to increased farm productivity. Flood damage analysis somewhat captures this, although it gauges the benefit in terms of reduced/prevented damages. In a more positive sense, flood protection makes possible more _intensive_ farm cultivation. Protected against floods, farmers are encouraged to undertake intensive farming practices such as intercropping, doublecropping, planting of high-value crops, or paddy-fish culture.

For this "what-if" exercise, Pangasinan's actual farm productivity for crop years 1986-1990 (see Table 5.5) is compared with the "with project" productivity levels in the flood damage analysis. The former represents "without project" conditions and the latter, the productivity potential of the area. The difference indicates the increase in productivity possible with flood control (see Table 5.6).

Incremental Incomes Owing to Productivity Improvement (P'000)				
Agricultural Land Use Type	Upper Agno	Pantal-Sinocalan	Cayanga-Pataran	Total
Paddy				
Irrigated	30,793	70,436	21,973	123,202
Rainfed	3,198	22,600	3,082	28,880
Other Crops				
Sugarcane	99	5,047	3,214	8,360
Corn	11,715	26,483	4,824	43,022
Legume	4,266	11,848	2,511	18,625
Total	50,070	136,414	35,511	222,089
Farmland Area (ha)	11,559	47,105	8,990	67,654
Average increase in Farm Income/ha	4,386	2,896	3,950	3,283

This is further translated to farm incomes, using the commodity price assumptions in flood damage analysis. In monetary terms, achievement of full productivity potential will lead to incremental farm incomes of ₱222 million. The Pantal-Sinocalan basin shows the greatest increases in absolute terms because it spans a greater area. However, Upper Agno basin is the highest in average increases.

Farm productivity and farm incomes can be potentially higher, particularly if farmers convert to high-value crops such as watermelons, peanuts or vegetables, or adopt double cropping. In typhoon-plagued areas, farmers often stick to cultivation of paddy and rice since crop insurance, which reduces their risks, is available only for these crops. With flood control, the risks against loss are reduced and farmers could now undertake more intensive cultivation of their farmlands.

5.5 Other Intangible Benefits

Given the protection afforded to the area, flood control will have long run, intangible effects, namely: enhancement of agricultural development; emergence of industries; structural changes in economic base and employment; increase in income and consumption; and improvement in quality of life. These have not been quantified.

5.5.1 Development of Agro-Industrialization

Increased agricultural production and productivity brought about by flood protection generates surpluses of farm produce that can be made available for agro-processing. The potential and comparative advantage for agro-based and aqua-based industries in Pangasinan, already substantial at present, becomes greater.

Enterpreneurial opportunities to develop forward and backward linkages to the farm sectors (e.g. food processing, manufacture of agriculture implements, etc.) should increase, particularly if authorities act to set up PIEs as envisioned under CAIDS. Since construction of roads, bridges, irrigation systems can proceed unhindered by recurrent floods, the pace of development should accelerate. Greater job opportunities will result for the local work force.

5.5.2 Changes in Economic and Job Structure

The emergence of more manufacturing and processing enterprises should slowly broaden the local economic base. The economic structure will gradually shift from largely agricultural-based to a broader-based economy; from cottage, craft-based industries to higher scale, greater value-added manufacturing industries.

In time, the quality of jobs will improve with development of manufacturing and services sectors. Urbanization will proceed at a faster pace. Market towns will evolve into agricultural processing and trading centers in the region. Although San Fernando, La Union is being positioned to become the region's main industrial center north of Metro Manila, the Pangasinan growth centers of San Carlos City, Dagupan City, Urdaneta, Alaminos and Sual might yet edge out San Fernando for that role.

5.5.3 Increase in Domestic Output, Income and Consumption

Short-run improvements in farm production and productivity and long-run structural shifts will lead to increased domestic output and increased average household incomes. Following the first round of investments and expenditures, there will be additional rounds of spending, the so-called multiplier effects. This will expand the consumer markets of Pangasinan. Benefits to society also accrue in form of expanded revenue base.

5.5.4 Improvement in Quality of Life

All of the above will induce an improvement in quality of life for Pangasinan's society. Higher incomes translate to improved living standards as workers enjoy greater access to social services such as health, nutrition, welfare, and education. Corollarily, the expanded tax base will increase government capability to provide social services.

5.6 Summary

To sum up, the potential contribution and impact of flood control to socio-economic development appears substantial. However, only the benefits due to prevention of direct and indirect damages are quantifiable. The other benefits are less straightforward to quantify.

I/O analysis measures the linkage effects of an infrastructure project like flood control. Through use of simplifying assumptions, quantification of the monetary impact of land enhancement, increased farm production and greater farm productivity has been tried.

Beyond this, estimation of the long-run benefits has not been attempted. Flood protection can indeed spur regional development, particularly since it centers on a thriving river basin economy like Pangasinan's. It is unrealistic to expect, however, that it will by itself suffice in bringing about all these positive changes. Other factors will have to be present like infrastructure support, favorable investment incentives, appropriate pricing policies, reasonable business costs, etc.

Without these attendant factors, flood protection will and cannot by itself bring about the positive effects.

In this regard, the intention in making the I/O analysis and the "what-if" cases is not to augment the benefit flow by adding whatever is quantifiable from other benefits to the direct benefits.

Rather, the intention is to demonstrate one important point: that it is realistic to use a growth factor for the benefit flow to reflect future development in an area that would be benefiting from flood control. The results of the I/O analysis and the "what-if" cases indicate that such growth is significant as seen in the linkage effects and in the measured monetary impact. Potential values that can be created are conservatively estimated at ₱1.1 billion annually which exceeds the direct benefits derived in flood damage analysis.

Measured Monetary Impact of Other Benefits
Through Use of Simplifying Assumptions (P'000)

Benefits	Upper Agno	Pantal-Sinocalan	Cayanga-Pataran	Total
Land Enhancement	111,658	583,146	123,402	818,206
Greater Farm Production	15,383	35,187	10,977	61,547
Improved Farm Productivity	50,071	136,414	35,604	222,089
Total	177,112	754,747	169,983	1,101,842

The future growth of assets within the project beneficial areas will largely be a function of: (a) the pace of the rehabilitation and reconstruction of earthquake damaged facilities; (b) continued recovery of Pangasinan's and of the Ilocos Region's economies within the context of macroeconomic structural adjustments; and (c) the direction of Pangasinan's development from a largely agri-based economy to an agro-industrial one. Flood protection serves to reinforce the development process.

Hence, it is safe to assume that the value of assets within the beneficial areas will increase at roughly the same pace as regional economic growth. For the period 1992-2000, an annual growth rate of 4.3% is projected for Ilocos, taking consideration the near-term economic difficulties and adjustments (see Section 4).

By 2001, gains from the rehabilitation and reconstruction would have been evident and result in the faster 4.6% growth for the region in that decade. By 2010, the economic structural adjustment measures would have taken root and filtered through the regions, pushing regional growth in Ilocos beyond 5%. And in 2020, the national economy would be exhibiting the robust growth of a NIC and Ilocos would be contributing to this stronger performance.

Given this outlook, the proposed growth factor for the benefit flow of 4.9%, the estimated growth for the beneficial areas from 1990-2010 (see Section 4.3.1) is deemed conservative. This is adopted in the cost-benefit analysis.

6. ECONOMIC EVALUATION OF FLOOD CONTROL PROJECTS

6.1 General

Economic evaluation reviews the economic justification of the flood control projects by use of the cost-benefit analysis. The future benefit and cost streams are discounted to their present values and compared to assess economic efficiency on the basis of: (a) Economic Internal Rate of Return (EIRR) and (b) Net Present Value (NPV).

The EIRR is the discount rate at which the sum of the discounted benefits of a project equals the sum of the discounted costs. The NPV measures the difference between the present value of the project costs and benefits at the assumed discount rate. A project is considered acceptable (a) if the EIRR equals or exceeds the social discount rate; or (b) if the NPV is greater than zero. The social discount rate is defined as the opportunity cost of capital or the rate of return at which the funds would have earned in its best alternative use. This is obtained from NEDA which currently sets it at 15%.

In economic evaluation, the project benefits are defined in terms of the income objective, i.e., benefits constitute an increase in the economy's real resources due either to increases in output or savings in resource use. Project costs in economic evaluation are reckoned in terms of usage of real resources. These consist of direct costs, including capital and construction costs, maintenance and operating expenses, and related costs. Taxes, depreciation, and interest payments are not considered economic costs as these represent mere transfer payments.

In valuation of costs and benefits, market prices are, in appropriate cases, converted to shadow or economic prices. Shadow prices are the values of project inputs and outputs, reflecting their relative scarcity or availability as well as their relative importance in achieving socio-economic objectives. The use of shadow prices arises from the need to consider price distortions brought about by market imperfections.