JAPAN INTERNATIONAL COOPERATION AGENCY

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
THE REPUBLIC OF THE PHILIPPINES

THE FEASIBILITY STUDY
OF
THE FLOOD CONTROL PROJECT
FOR
THE LOWER CAGAYAN RIVER
IN
THE REPUBLIC OF THE PHILIPPINES

FINAL REPORT

VOLUME III-2

SUPPORTING REPORT

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FEBRUARY 2002

NIPPON KOEI CO., LTD.
NIKKEN Consultants, Inc.

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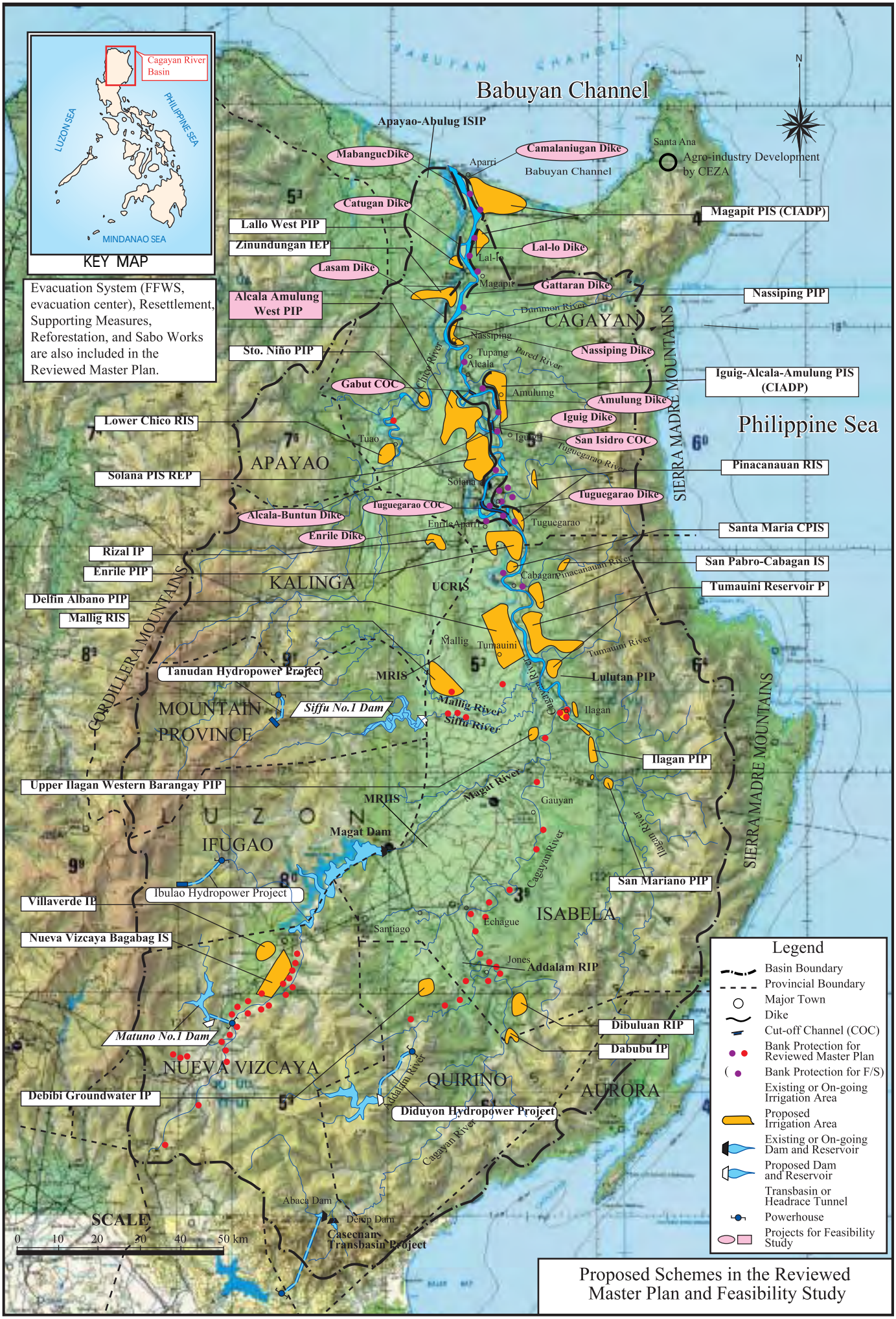
The cost estimate is based on the price level and exchange rate of June 2001.

The exchange rate is:

US$1.00 = PHP50.0 = ¥120.0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SCALE
0 10 20 30 40 50 km
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PHILIPPINE SEA
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SIERRA MADRE MOUNTAINS
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List of Annex

List of Acronyms

A&D	Alienable and Disposable Land
ADB	Asian Development Bank
AFMA	Agro-fishery Modernization Act
AFP	Armed Forces of the Philippines
Agromet	Agro-meteorological Station, PAGASA
AIT	Asian Institute of Technology
ALECO	Albay Electric Cooperative
AO	Administrative Order
APDMC	Asia Pacific Disaster Management Centre
ARC(s)	Agrarian Reform Committee(s)
ASEAN	Association of Southeast Asian Nations
B/C	Benefit-Cost Ratio
BAS	Bureau of Agricultural Statistics
BDCC	Barangay Disaster Coordinating Council
BFP	Bureau of Fire Protection
BM	Bench Mark
BMG	Bureau of Mines and Geo-science
BOC	Bureau of Construction (DPWH)
BOD	Bureau of Design (DPWH)
BOD	Biochemical Oxygen Demand
BOI	Board of Investment
BOT	Bureau of Telecommunication
BRS	Bureau of Research and Standard, DPWH
BSWM	Bureau of Soils and Water Management
CAR	Cordillera Administrative Region
CARP	Comprehensive Agrarian Reform Program
CBIS	Community-Based Information System
CDA	Cooperative Development Authority
CDCC	City Disaster Coordinating Council
CENRO	Community Environment and Natural Resources Office
CEZA	Cagayan Economic Zone Authority
CIADP	Cagayan Integrated Agricultural Development Program
CLUP	Comprehensive Land Use Plan
CPDC	City Planning and Development Coordinator
CPDO	City Planning and Development Office
DA	Department of Agriculture
DA-BFAR	Department of Agriculture – Bureau of Fisheries and Aquatic Resources
DAR	Department of Agrarian Reform
DBM	Department of Budget and Management

DCC	Disaster Coordinating Council
DECS	Department of Education, Culture and Sports
DENR	Department of Environment and Natural Resources
DFA	Department of Foreign Affairs
DILG	Department of the Interior and Local Government
DO	Department Order
DO	Dissolved Oxygen
DOE	Department of Energy
DOH	Department of Health
DOLE	Department of Labor and Employment
DOST	Department of Science and Technology
DOT	Department of Tourism
DOTC	Department of Transportation and Communication
DPWH	Department of Public Works and Highways
DSWD	Department of Social Welfare and Development
DTI	Department of Trade and Industry
ECA	Environmental Critical Area
ECC	Environmental Compliance Certificate
EIA	Environmental Impact Assessment
EIAPO	Environmental Impact Assessment Project Office
EIS	Environmental Impact Statement
EIRR	Economic Internal Rate of Return
EMB	Environmental Management Bureau
ENRO	Environment and Natural Resources Office (Provincial Government)
EO	Executive Order
FIDA	Fiber Industry Development Authority, DA
FIRR	Financial Internal Rate of Return
GA	Government Agency
GDP	Gross Domestic Product
GIS	Geographical Information System
GOJ	Government of Japan
GOP	Government of the Philippines
GPS	Global Positioning System
GRDP	Gross Regional Domestic Product
GVA	Gross Value Added
HLURB	Housing and Land Use Regulatory Board
HUDCC	Housing and Urban Development Coordinating Council
IBRD	International Bank for Reconstruction and Development
IEE	Initial Environmental Examination
IRA	Internal Revenue Allotment
JAFTA	Japan Forest Technical Association

JBIC	Japan Bank for International Cooperation (Ex-OECF & EXIM)
JICA	Japan International Cooperation Agency
LARC	Local Amateur Radio Club
LBP	Land Bank of the Philippines
LGU(s)	Local Government Unit(s)
LTO	Land Transportation Office
LWD	Local Water District
LWUA	Local Water Utility Agency
M/D	Minutes of Discussion
MDCC	Municipal Disaster Coordinating Council
MLUC	Municipal Land Use Committee
MM	Minutes of Meeting
MMSL	Meters above Mean Sea Level
MPDC	Municipal Planning and Development Coordinator
MPDO	Municipal Planning and Development Office
MTPDP	Medium Term Provincial Development Plan
NAAD	Network of Areas for Agricultural Development
NAMRIA	National Mapping and Resource Information Authority
NAPHIRE	National Post Harvest Institute for Research and Extension
NCDPP	National Calamities and Disaster Preparedness Plan
NCIP	National Commission on Indigenous Peoples
NCR	National Capital Region
NDCC	National Disaster Coordinating Council
NEDA	National Economic and Development Authority
NEPC	National Environmental Protection Council
NFA	National Food Authority
NGA(s)	National Government Agency (Agencies)
NGO(s)	Non-Government Organization(s)
NHA	National Housing Authority
NIA	National Irrigation Administration
NIPAS	National Integrated Protected Areas System
NPC	National Power Corporation or NAPOCOR
NPAAD	Network of Protected Areas for Agricultural Development
NPV	Net Present Value
NSCB	National Statistical Coordination Board
NSO	National Statistics Office
NTC	National Telecommunication Commission
NWRB	National Water Resources Board (Ex-NWRC)
O&M or O/M	Operation and Maintenance
OCD	Office of Civil Defense

PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PAMB	Protected Area Management Board
PAWB	Protected Area and Wildlife Bureau
PCA	Philippine Coconut Authority
PCM	Project Cycle Management
PCG	Philippine Coast Guard
PD	Presidential Decree
PDCC	Provincial Disaster Coordinating Council
PDMO	Provincial Disaster Management Office
PDZ	Permanent Danger Zone
PENRO	Provincial Environment and Natural Resources Office
PFDA	Philippine Fishery Development Authority
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PHO	Provincial Health Office
PIA	Philippine Information Agency
PMO	Project Management Office (DPWH)
PMO-MFCP	Project Management Office - Major Flood Control Project
PMS	Presidential Management Staff
PNP	Philippine National Police
PNR	Philippine National Railways
PNRC	Philippine National Red Cross
PPA	Philippine Port Authority
PPDC	Provincial Planning and Development Coordinator
PPDO	Provincial Planning and Development Office
PPFP	Provincial Physical Framework Plan
PRA	Participatory Rural Appraisal
PSWDO	Provincial Social Welfare and Development Office
PTA	Philippine Tourism Authority
RA	Republic Act
RDC	Regional Development Council
RDCC	Regional Disaster Coordinating Council
RPFD	Regional Physical Framework Plan
RRA	Rapid Rural Appraisal
SAFDZ	Strategic Agricultural and Fisheries Development Plan
SRA	Social Reform Agenda
SS	Suspended Solid
SW	Scope of Works
TESDA	Technical Education and Skills Development Authority
TOR	Terms of Reference

Measurements

Length

mm	=	millimeter
cm	=	centimeter
m	=	meter
km	=	kilometer
LM	=	linear meter

Area

m^2	=	square meter
ha	=	hectare
km^2	=	square kilometer

Volume

cm^3	=	cubic centimeter
l	=	liter
kl	=	kiloliter
m^3	=	cubic meter

Derived Measures

m/sec	=	meter per second
m^3/sec	=	cubic meter per second
kWh	=	kilowatt hour
MWh	=	megawatt hour
GWh	=	gigawatt hour
PPM	=	parts per million
kmph	=	kilometer per hour

Weight

g	=	gram
kg	=	kilogram
ton	=	metric ton

Currency

PHP	=	Philippine Peso
¥	=	Japanese Yen
US$	=	US Dollar

Time

sec	=	second
min	=	minute
hr	=	hour
d	=	day
y	=	year

Other Measure

%	=	percent
^{o}	=	degree
^oC	=	degree(s) Celsius
10^3	=	thousand
10^6	=	million
10^9	=	billion

Energy

W	=	watt
kW	=	kilowatt

Fiscal Year

January 1 to December 31

ANNEX VII :
WATERSHED MANAGEMENT

THE FEASIBILITY STUDY OF
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ANNEX VII WATERSHED MANAGEMENT

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CHAPTER 1 FUNCTIONS OF WATERSHED MANAGEMENT

1.1 General

Generally, the watershed means the entire river basin. The watershed includes all the components located therein such as soils, water and forests.

The watershed management may be defined as the management of watershed resources in a holistic and sustainable manner to protect and rehabilitate land, water and associated ecological resources, while recognizing the need to advance economic development and quality of life.

1.2 Functions of Watershed Management

The soils, especially forest soils created by forests in the watershed store rain water, which leads to reduced flood peaks and flow increases. The forest soils also absorb energy of raindrops and reduce surface flows, which results in soil erosion reduction. The soils maintain and improve water quality, too. The forests absorb carbon dioxide, supply oxygen, accelerate evapo-transpiration and maintain hydrological cycle in the watershed. The forests also prevent land collapse, wind, fire, sound, and so on.

Reduction of the forest area will result in increase of flood peaks, decrease of low flows, increase of sediment yields, and degradation of the ecosystem. Earthquakes and eruptions will induce increase of sediment yields and occurrence of debris flows. The watershed management is required to cope with the above phenomena.

Sabo dams function to store a part of sediment and to reduce the sediment yield by making river bed slopes gentle.

1.3 Existing Researches for Functions of Forest

The forest functions to reduce flood peaks, to increase low flow and to mitigate soil erosion in the watershed. Some results of researches and studies on these functions are presented below, which have been made so far in the Philippines and other countries to manifest the effects of the forests.

1.3.1 Effect to Reduce Flood Peaks and Increase Low Flow

A simulation was made by Dr. Fukushima in Japan in 1987 by applying to a runoff model experimental data on runoff from lands of various vegetation in order to clarify a change of the relationship among evapo-transpiration, direct

runoff and baseflow of the watershed under various conditions of land cover change from bareland to forest. The simulation result shows the following relationship:

	Just after Reforestation	100 years after Reforestation
Evapo-transpiration	25% of rainfall	45% of rainfall
Direct Runoff	50% of rainfall	25% of rainfall
Baseflow	25% of rainfall	30% of rainfall

The direct runoff and baseflow mean runoffs during rain and no-rain, respectively. The table shows the effect of the forest reducing the direct runoff and increasing the baseflow.

1.3.2 Effect to Mitigate Soil Erosion

Some studies have been conducted by the development projects or study groups for the soil erosion of the Magat watershed in the Cagayan River basin as follows:

1) Magat Watershed Feasibility Study, NIA, 1985,
2) The Economic Impact of Soil Erosion in the Pantabangan and Magat Watersheds, Upland Resource Policy Program Project funded by the Philippine Institute for Development Studies and the International Development Research Center of Canada, 1987,

Both of the above studies estimated soil erosion rate of the interested basins by applying the modified universal soil loss equation and past sediment yield data. However, no detailed or quantitative discussion has been made about the applicability of the equation to the basin and consistency of the estimated rate with the sedimentation record of the Magat reservoir.

In the Magat Watershed Feasibility Study, measurements of the soil erosion and sediment flow have been made in the representative catchments of the Magat watershed at Aritao, Dallao and Tapaya. Unfortunately, the data collected during the measurement are insufficient to examine the soil erosion rate for the various land covers.

The following table shows a study result made by Professor T. Kawaguchi in Japan on the relationship between soil erosion and land use:

Land Use	Waste	Bare	Agriculture	Grass	Forest
Annual Erosion (mm/year)	10^{1}-10^{2}	10^{0}-10^{1}	10^{-1}-10^{0}	10^{-2}-10^{-1}	10^{-2}-10^{-1}

CHAPTER 2 PRESENT WATERSHED CONDITION

2.1 General

This Chapter describes present situation of the watershed in the Cagayan River basin in terms of forest cover and soil erosion.

2.2 Forest Cover

The present forest cover of the Cagayan River basin as estimated is 37% of the total basin area based on the Strategic Agriculture and Fisheries Development Zone (SAFDZ) data of BSWM, or 41% based on the Forest Register (1994) prepared by Japan Forest Technical Association (JAFTA) with the cooperation of DENR, NAMRIA and RSRDAD. The Forest Register also shows that 38% of the total forest area is old-growth forest and 60% is residual forest.

Figure 2.8.4 of the Main Report shows the present watershed condition of the Cagayan River basin.

The Land Limitations Map of Region 2 and CAR issued in 1995 by BSWM, which presents erosion condition, shows that the upper Magat, upper Cagayan and upper Chico watersheds are moderate to severe erosion areas with land slope of more than 30%. According to the reconnaissance survey carried out by air and land, less forest cover and denuded areas can be seen in the upper Magat and upper Cagayan watersheds.

2.3 Soil Erosion

In the upper Magat River Basin including the Santa Cruz River, Balilim River and Santa Fe River, issues on land collapse and sediment deposit caused by the earthquake occurred in July 1990 are remarkable. The field survey conducted through interviews with the local people residing beside the rivers revealed the depth of sediment deposited in the river course reached 1 to 6 m after the 1990 earthquake. The above land collapse/sediment as well as severe basin erosion have affected the reservoir capacity of the Magat Dam.

The NIA record of the Magat reservoir sedimentation is available as shown below:

Year of Survey	Accumulated Sediment Volume (MCM)	Average Annual Sediment Rate (MCM/year) (mm/year)		
1984	22.0	7.3	(1982-1984)	1.8
1988-1989	49.0	6.7	(1982-1989)	1.6
1995	179.0	12.8	(1982-1995)	3.1
1998	181.0	10.6	(1982-1998)	2.6
1999	188.0	10.4	(1982-1999)	2.5

Source: 1999 Survey Results – Magat Reservoir and Tributary Rivers Sediment Range System, Dam and Reservoir Division, Magat River Integrated Irrigation System, December 2000

CHAPTER 3 EXISTING WATERSHED CONSERVATION/ MANAGEMENT PLANS

3.1 Regional Master Plan for Forestry Development

DENR Region 2 and DENR Cordillera Administrative Region (CAR) have respective regional master plan for forestry development. The goals of both master plans are efficient utilization, equitable access and sustainability of forest resources. The plans cover forest management and production program, program on man and the environment, institutional development program and implementation program of the regional master plan.

The master plan of DENR Region 2 covers the forest development period of 25 years from 1992 to 2016. The plan requires a budget of Pesos 24.1 billion spread over 25 years and has the following major development targets:

1) Community Based Forest Management (CBFM) projects to cover 969,000ha of forestlands by 172,000 families mainly for plantation and tree farming,
2) Soil and water conservation projects covering 738,000ha,
3) Protected area of 856,000ha,
4) 15 mini-parks in urban areas, and,
5) Establishment of minor forest products plantation covering 69,000ha such as bamboo, rattan, nipa, etc.

The master plan of DENR CAR covers the forest development period of 24 years from 1992 to 2015. The plan needs funding of Pesos 20.3 billion for 24 years with the following major development targets:

1) CBFM projects covering 537,458ha by 194,575 families mainly for plantation and tree farming,
2) Soil and water conservation projects for 45 areas covering 884,000ha,
3) Management of 79,000ha of protected forest reserves,
4) Urban tree parks covering 600ha and 5 botanical/zoological gardens, and,
5) Minor forest products development covering 23,430ha.

3.2 Other Watershed Management Plans

(1) Medium Term Development Plan of DENR Region 2

DENR Region 2 has prepared their medium term development plan (1999-2004), that contains forest cover increasing target to 178,500 ha and other programs on vegetative and structural measures.

(2) Five-Year Integrated Watershed Management Plan of Upper Magat River Basin

The plan was undertaken and submitted by the PENRO of Ifugao Province in January 2001. It requires a budget of Pesos 238 million for 5 years. The target activities and projects are law enforcement and forest protection to cover an area of 175,500ha of forestlands, reforestation of 500ha of forestlands, establishment of tree and fruit tree farms covering a total area of 250ha, etc.

(3) Five-Year Ganano Watershed Management and Development Plan

The Ganano watershed covers an approximate area of 231km^2. The plan has a proposed budget of Pesos 69 million. The major components of the plan are reforestation of 1,665ha of denuded watershed, agroforestry of 350ha, watershed rehabilitation and erosion control with vegetable and structural measures, infrastructure, etc.

3.3 Preparation of Forest Information in Wide Area and Forest Management Planning

The study was conducted by JICA from August 1985 to June 1988 to develop the management plan of the forest resources in the whole Cagayan River basin.

The study included collection and analysis of data on forest covers and related natural/social environment and formulation of forest management plans for the entire Cagayan River basin and the selected model area of around 50,000ha in the Cagayan River basin with a view to conserving the natural environment as well as to stabilizing socioeconomic conditions.

The proposed forest management plan for the entire Cagayan River basin presents the forest management criteria for each of the divided 306 management units as seen in Figure 3.3.1. The management criteria were developed by combining the following 5 classifications; a) areas with high potential for natural hazards requiring prohibition of felling for forest protection, b) areas with fairly high potential for natural hazards allowing selective cutting subject to soil conservation,

c) areas with low potential for natural hazards permitting clear cutting and afforestation subject to planned management, d) areas with the continuing presence of soil erosion and land hazards requiring active reforestation to prevent hazards, and e) areas with the continued relative absence of soil erosion and land hazards requiring reforestation stressing soil enrichment.

The present natural and social conditions for each management unit were analyzed in developing the management criteria, which include elevations, slopes, vegetation and land use, legal and regulatory restrictions, soil erosion potential, land collapse/slide potential, water holding potential, flooding potential, vegetation impacts on soil erosion potential, land collapse/slide potential and water holding potential, and tree growth potential.

The forest management plan for the model area provides the technical procedures and guidelines for the effective implementation of the forest management in the model area. In the plan, 6 activities are proposed, which are reforestation, seedling production, timber production, forest road construction, forest conservation, and park/recreation/forest protection.

3.4 Masterplan Study for Watershed Management in Upper Magat and Cagayan River Basin

The masterplan study is being conducted by JICA. The objective of the study is to formulate a master plan for watershed rehabilitation and management, with a target year of 2015, which shows priority areas for reforestation, based on the results of a natural and socio-economic conditions survey and the findings of a pilot study conducted in model sites. The study area covers the watershed of the upper Magat and Cagayan River basin with a total area of approximately 970,000ha.

CHAPTER 4 PAST AND ONGOING WATERSHED MANAGEMENT ACTIVITIES

4.1 Activities by the Government

4.1.1 Activities of DENR

DENR Region 2 has several programs/projects focused on the rehabilitation, development and protection of environmentally and economically critical watersheds in the Cagayan basin. Activities undertaken are establishment of forest plantation, construction of check dams, water impounding dams and bench brush layers, seeding and other similar vegetative and engineering measures. The following are their major activities, of which the locations are shown in Figure 4.1.1:

1) Lipatan watershed rehabilitation project, 850ha, reforestation,
2) Zinundungan River watershed rehabilitation project, 13,000ha, reforestation,
3) Dicamay River watershed rehabilitation project, 4,194ha, reforestation and checkdam construction,
4) Diadi River sub-watershed rehabilitation project, 1,400ha, reforestation, wattling and checkdam construction,
5) Slope stabilization and protection plan of Dalton Pass section, checkdam construction and brush & seeding works,
6) Upper Casecnan watershed project, 18,268ha, checkdam construction and reforestation,
7) Kasibu River watershed project, 11,233ha, reforestation and checkdam,
8) Kirang macro watershed rehabilitation project, 2,600ha, reforestation, wattling and checkdam construction,
9) Tangliao sub-watershed rehabilitation project, 830ha, reforestation,
10) Tungcab sub-watershed rehabilitation project, 2,800ha, reforestation and checkdam construction,
11) Community Based Forest Management Projects (CBFMP), 26 projects in Cagayan, 21 projects in Isabela, 20 projects in Nueva Vizcaya, 32 projects in Quirino (for all Region 2).

DENR CAR has also implemented some projects in the watershed of the Cagayan River such as check dam construction, stone masonry and riprap, and wattling and plantation.

Table 4.1.1 shows a list of regular reforestation projects of DENR Region 2 and CAR. Table 4.1.2 gives a list of CBFM projects in Region 2 and CAR.

4.1.2 Activities by Other Government Agencies

Other government agencies such as NIA, NAPOCOR(NPC), and Local Government Units also worked hand in hand with the DENR in the protection, development and rehabilitation of critical watersheds in the Cagayan River basin as follows:

1) Reforestation by NIA, NPC and DENR for Magat River basin: Areas being reforested and maintained are 2,066 ha by NIA, 1,017 ha by NPC and 1,113 ha by DENR,
2) Watershed development and management for the Casecnan Multi-purpose Irrigation and Power Project (CMIPP) by NIA: Watershed protection, rehabilitation and development,
3) Barobbob Watershed Project (439 ha), Santa Fe Reforestation Project (6,000 ha), Lower Magat Forest Reserve (24,000 ha), and Bangan Hills Reforestation (50 ha) by Nueva Vizcaya Province

4.2 Foreign Assisted Projects

Some foreign-assisted watershed management projects were implemented or are ongoing in the Cagayan River basin as follows:

(1) Environment and Natural Resources-Sectoral Adjustment Loan Program (ENR-SECAL) in Nueva Vizcaya, Quirino, Cagayan, Isabela, Ifugao, Kalinga, Apayao, and Mt. Province:

Project duration of 7 years from 1992 to 1999, Funding agency of World Bank, Activities of local social development, community resources development, infrastructure development, information and education, etc.,

(2) Forestry Sector Project (FSP) in Lamut, Mayoyao, Dumayop:

Project duration of 7 years from 1993 to 2000, Funding agency of JBIC, Main activities of community organizing and comprehensive site development including tree planting, infrastructure development, etc.,

(3) Natural Resources Management Program II–Forest Resources Management Component (NRMP-FRM) in Region 2:

Project duration of 7 years from 1995 to 2002, Funding agency of USAID, Main activities of CBFM, ancestral domain management, IEC, training, etc.,

(4) Philippine-German Community Forestry Project-Quirino (CFPQ):

Project duration of 10 years from 1992 to 2001, Funding agency of GTZ and KFW, Activities of agriculture/agroforestry, community forestry, community-implemented infrastructure, etc.,

(5) DENR-ITTO (International Tropical Timber Organization) Project at Bayombong, Nueva Vizcaya:

The first phase entitled "Plantation Establishment Methods" was implemented from 1995 to 1997 involving the establishment of 16 ha experimental plantation and measurement of growth parameters. The second phase with the title of "Developing Tropical Forest Resources through CBFM" started in July 1998 aiming at 100 ha of new plantation by July 2001 and 3,000 ha of forest protection through CBFM,

(6) Conservation of Priority Protected Areas Project (CPPAP) in Northern Sierra Madre Natural Park:

Project duration of 7 years from 1994 to 2001, Funding agency of Global Environmental Facility (GEF) thru World Bank, Main activities of forest and biodiversity conservation, and provision of livelihood projects.

(7) OISCA (Organization for Industrial, Spiritual and Cultural Advancement) in Karang, Aritao:

Main activities of reforestation of 500 ha started in 1993, children's forest program started in 1992,

(8) Plan International, Northern Sierra Madre Natural Park Conservation Project:

Started in 1996, Financed by the Plan International and Netherlands Government, Project components of livelihood projects and biodiversity research.

Outline of the foreign assisted projects including the above is presented in Table 4.2.1.

CHAPTER 5 WATERSHED CONSERVATION PLAN

5.1 Basic Concept of Watershed Conservation

5.1.1 Present Issues

Problems encountered in the existing watershed management of the Cagayan River basin are lack of detailed and comprehensive watershed management plan and insufficient activities of watershed conservation in spite of present degradation of the watershed.

In the 1987 Master Plan studied by JICA, the watershed management plan for the Cagayan River basin was not included. JICA, however, carried out the another study for the watershed management of the basin, which is "Preparation of Forest Information in Wide Area and Forest Management Planning in the Republic of the Philippines" in 1988 (1988 JICA Study). The 1988 JICA Study provided a forest management plan of the basin, in which prohibited or permissible locations of tree cutting in the forest area and locations of active reforestation in the grass land are recommended in order to prevent natural hazards. However, areas of the tree cutting and reforestation are not specified in the 1988 JICA Study.

5.1.2 Basic Concept of Watershed Conservation

Main objectives of the watershed management to be examined in this JICA Study are to mitigate the flood magnitude and to reduce the sediment yield of the Cagayan River basin, and to function as a measure of the flood control of the Cagayan River.

This JICA Study has examined and formulated at a preliminary level a watershed conservation plan of the entire Cagayan River basin. Components to be incorporated in the plan are reforestation and sabo works, which are common and effective measures for the watershed conservation.

This JICA Study is limited to formulation of the master plan on the watershed conservation. Therefore, this Study recommends the Government of the Philippines to conduct the feasibility study including further investigations and detailed studies to formulate the detailed reforestation plans and sabo works plans to follow for their immediate implementation after this JICA Study.

5.2 Reforestation Plan

5.2.1 Area of Reforestation

Area of the required reforestation in the Cagayan River basin has been estimated on an assumption that all the land area, of which the slope is over 18%, except for present agricultural land should be covered by the forest or other vegetation listed into the forest category. The slope limit of 18% is basically applied for division of lands of the public domain into forest lands in the Department of Environment and Natural Resources (DENR).

The land area with the slope over 18% was delineated and measured based on the slope map shown in Figure 5.2.1 developed by the Bureau of Soils and Water Management (BSWM) of the Department of Agriculture (DA) in 1995, which is the only map presently available.

The present forest area and agricultural land area were delineated and estimated by using the Land Use and Forest Type Map and Forest Register prepared in 1995 by Japan Forest Technical Association (JAFTA) with the cooperation of DENR, National Mapping and Resource Information Authority (NAMRIA) and Remote Sensing and Resource Data Analysis Department (RSRDAD). The Land Use and Forest Type Map and Forest Register were derived from the Landsat TM taken in 1992 and 1993 and show the latest forest information of the Cagayan River basin. The maps are compiled in Data Book.

The estimated present forest cover consists of areas of old-growth forest, mossy forest, residual forest, sub-marginal forest, pine forest, mangrove forest, reproduction brush, and forest plantations (coconut plantation and other plantation), which are regarded as the forest category according to DENR standard.

The delineated present forest area was overlaid on the land area with the slope over 18% and the area of non-forest within the land steeper that 18% was estimated as seen in Table 5.2.1. The estimate was made for each of 35 forest compartments, which were introduced by JAFTA in 1995 for the forest management.

The area of the past reforestation implemented after the year of 1993 when the used Landsat TM was taken was accumulated based on the collected data for JBIC funded projects, Casecnan watershed management and DENR projects as shown in Table 5.2.1. Detailed data on ADB funded projects and Community Based Forest Management (CBFM) projects are not available, hence reforestation area of these projects are not included in the past reforestation area estimates.

The area of the requiring reforestation for the entire Cagayan River basin has been estimated to be 3,188km^2 as shown in Table 5.2.1 and Figure 5.2.2, and summarized below.

Sub-basins	Land Area over 18% Slope excluding Agricultural Land (km^2)	Present Forest Area in Land over 18% Slope (km^2)	Proposed Reforestation Area (km^2)
Upper Cagayan River basin	3,657	3,266	391
Magat River basin	3,670	2,443	1,227
Ilagan River basin	2,389	2,371	18
Siffu-Mallig River basin	1,032	694	338
Chico River basin	3,832	3,249	583
Lower Cagayan River basin	2,380	1,749	631
Whole Cagayan River basin	16,960	13,772	3,188

5.2.2 Implementation of Reforestation

The Executive Order No.263 (EO 263), entitled "Adopting Community Based Forest Management as the National Strategy to Ensure the Sustainable Development of the Country's Forest Lands Resources and Providing Mechanisms for its Implementation" was issued in 1995. It stipulates that the community based forest management (CBFM) shall be the national strategy to achieve sustainable forestry and social justice. Pursuant to EO 263, the CBFM strategy has been implemented by DENR through the cooperation of LGUs to attain the sustainable development and management of the forest. The watershed conservation plan formulated in this JICA Study follows this strategy.

In addition to the CBFM strategy, an active participation of the volunteers such as schoolchildren, students and NGOs in the reforestation activity is recommended in this JICA Study.

5.2.3 Cost of Reforestation

The investment cost for the reforestation of 318,800ha was estimated under the following conditions:

1) Source of unit prices for forest tree plantation and agroforestry is "Guidelines governing the updating of cost estimates and intensification of plantation maintenance and protection activities for DENR-FSP watershed subprojects under JBIC funding, DENR, (2000)".
2) Agroforestry and rehabilitation of infrastructure are included to ensure peoples' livelihood and attain sustainable reforestation activities. Area of the agroforestry is set at 10% of the total reforestation area. The rehabilitation of infrastructure consists of rehabilitation of farm to market

roads, inspection/maintenance roads, etc. of which the cost is 2% of sum of the forest tree plantation cost and agroforestry cost.

3) Participation of volunteers is expected in the plantation establishment, maintenance and protection. 50% of manpower is assumed to be shared by the volunteers in the plantation establishment, maintenance and protection.
4) No land compensation cost is considered since the reforestation is to be implemented by the CBFM procedure.
5) Engineering services and administration costs are included in the unit prices for forest tree plantation and agroforestry.

The estimated investment cost is as follows:

Work Item	Unit	Work Quantity	Unit Price (Pesos)	Amount (Million Pesos)
Forest Tree Plantation	ha	287,000	13,200	3,788
Agroforestry	ha	31,800	14,900	474
Rehabilitation of infrastructure	LS	□	□	85
Compensation	LS	□	□	0
Contingency (15% of the above)	LS	□	□	653
Total		□	□	5,000

The annual operation and maintenance cost is Pesos 1,500/ha/year, which was given by PENRO Isabela, DENR.

5.2.4 Recommendation of Further Study

The reforestation plan mentioned above has been formulated at a preliminary level on the basis of the limited information and field reconnaissance. Further data collection and analysis, intensive field reconnaissance and detailed study are recommended for the formulation of detailed reforestation plan and immediate implementation of the plan.

Experimental research is also recommended in the Cagayan River basin to investigate land use, runoff and sediment yield so that valuable information is obtained for future watershed management including the formulation of the detailed reforestation plan.

5.3 Sabo Works Plan

5.3.1 Sediment Yield

The hydrological study of the Reviewed Master Plan confirmed the applicability of the basin average sediment yield of 1.5mm/year for the entire Cagayan River basin, which has been derived in the 1987 Master Plan.

In order to assume the sediment yield for each sub-basin of the Cagayan River basin, Murano's equation was introduced, since no other equation is available due to insufficient sediment data of the basin. The sub-basin is the same as that for the flood analysis. The Murano's equation was developed based on the sediment deposit data of the existing 103 sabo dams in Japan, and factors of catchment areas, annual rainfalls, elevations and undulations are incorporated in to the equation. The Murano's equation is as follows:

$$\log q_s = a + b*\log A + c*\log R + d*\log M_E + e*\log R_r$$

Where, q_s : Specific sediment yield (m^3/year/km^2)
A : Catchment area (km^2)
R : Annual mean rainfall (mm)
M_E : Basin mean elevation (m)
R_r : Undulation
a, b, c, d, e : coefficients shown below,

Geology	a	b	c	d	e
Palaeozoic, Mesozoic	-8.5498	-0.3926	1.3380	0.2523	0.0955
Tertiary, Quaternary	-2.7844	-0.0618	2.0970	0.1071	1.8900
Volcanic	-2.9090	-0.3928	0.9728	0.9631	-0.2270

The Murano's equation derives around 31 million m^3 of annual sediment yield for the entire Cagayan River basin, while 41 million m^3 of the annual sediment is computed based on the denudation rate of 1.5mm/year. Although these values are different, the Murano's equation was applied for the assessment of sediment balance of the basin, because the available data are limited to discuss the differences of the sediment yield estimations. The estimate result of the sediment yield by Murano is summarized as follows:

Sub-basins	Catchment Area (km^2)	Sediment Yield by Murano (MCM/year)	(mm/year)
Upper Cagayan River basin	6,633	6.8	1.0
Magat River basin	5,113	6.4	1.3
Ilagan River basin	3,132	2.4	0.8
Siffu-Mallig River basin	2,015	0.9	0.4
Chico River basin	4,551	11.6	2.5
Lower Cagayan River basin	5,837	2.7	0.5
Whole Cagayan River basin	27,281	30.8	1.1
Whole Cagayan basin except Magat Dam basin	23,138	24.4	1.1

In the Magat River basin, the record of the Magat reservoir sedimentation is available, which is shown in Figure 5.3.1.

The river deposit accumulated after the earthquake which occurred in July 1990 at the upstream of the Magat reservoir was investigated and the deposit volume was estimated to be 30 million m^3 based on interview surveys of the deposit depth. The total sediment to be transported from the Magat basin is regarded as the sum of the sediment volumes in the reservoir and the river deposit.

5.3.2 Sediment Balance and Target Area of Sabo Works

According to the estimate results by the Murano's equation, the high sediment yield areas are the Upper Cagayan, Magat and Chico River basins, of which major parts have the sediment yield of more than 1,500m^3/km^2/year. These areas overlap the area of severe erosion delineated in the BSWM erosion map. The annual sediment yield estimated by Murano is 24 million m^3 for the whole Cagayan River basin excluding the Magat Dam basin.

On the other hand, the annual sediment transport capacity was reviewed for the lower Cagayan River to be in the range between 5 and 8 million m^3 as described in Annex IV. Comparison of the transport capacity and annual sediment yield mentioned above may lead to a conclusion that more than 10 million m^3 of the sediment is deposited in the Cagayan River and tributaries.

However, riverbed of the lower Cagayan River is rather stable as stated in Annex VI. According to the field investigations made by this JICA Study, no remarkable riverbed fluctuation has been found in the Cagayan River basin except for the Magat River basin. The imbalance of the sediment yield and transport of the Cagayan River may be caused by inaccurate estimate of both of the sediment yield and transport due to insufficient information. Therefore, respecting the result of the investigation, the sabo works plan was not formulated in the Cagayan River basin except for the Magat basin.

The existing Magat Dam faces the reservoir sedimentation problem, which has been accelerated by land collapses in the Magat River basin caused by the earthquake occurred in July 1990. Urgent sabo works are required in the upstream of the Magat reservoir to extend the reservoir life of the Magat Dam.

5.3.3 Required Number of Sabo Dams in the Magat River Basin

Sabo dams are constructed for storing excess sediment. The excess sediment is the sediment yield deducted by the allowable sediment to be released downstream. The following conditions are considered in estimating the number of the sabo dams required upstream of the Magat reservoir:

1) In estimating the sediment yield, the sediment record of the Magat reservoir

was used. Among the sub-basins No. 13 to 19 in the Magat basin as seen in Figure 5.3.2, sub-basins No. 13 and 14 are the most erosive areas, which were fractured by the 1990 earthquake. The increased sediment yield after 1990 by the earthquake is assumed to come from the sub-basins No. 13 and 14. The sediment yield of the remaining sub-basins is the same as that before the earthquake. The former is 12,800m^3/km^2/year and the latter is 1,600m^3/km^2/year

2) It is assumed that the reforestation contributes to reduce the sediment yield by 50%.
3) The construction of a series of sabo dams will reduce the slope of riverbed, which will decrease the sediment transport and consequently mitigate the sediment yield. The effect of the riverbed slope decreasing is applied for estimating the sediment yield reduction.
4) The allowable sediment to be released downstream of the sabo dam is the same as the designed sediment inflow to the Magat reservoir of 5.5 million m^3/year.
5) The sediment volume to be stored by the sabo dam is computed assuming that the slope of sediment deposit will become 50% of the original river gradient. The design life of 20 years is considered in estimating the required number of the sabo dams. The height of the sabo dam is 25m.

Calculation result of the required number of the sabo dams is summarized below.

Sub-basin No.	Catchment Area (km^2)	Required No. of Sabo Dam (nos)	Total Storing Volume (Million m^3)
13	620	7	95
14	292	10	55
15	550	3	16
16	1,228	1	29
17	628	4	19
18	559	1	15
19	266	0	0

The total number of the required sabo dams was estimated to be 26 nos. Figure 5.3.2 shows the required number of the sabo dams for each sub-basin of the Magat River basin.

5.3.4 Cost of Sabo Dams

The cost for construction of 26 sabo dams was estimated under the following conditions:

1) 26 sabo dams have the same bottom width, height and upstream/ downstream slopes of 50m^3, 25m, 1:0.6/1:0.2, respectively.

2) No land compensation cost is considered since sites of the dam construction will be in remote areas where the sites with no agricultural lands or roads in the vicinity can be selected.

The estimated construction cost is as follows:

Work Item	Unit	Work Quantity	Unit Price (Pesos)	Amount (Million Pesos)
1. Main Works				26
1.1 Preparatory Works (8% of 1.2&1.3)	LS	□	□	6
1.2 Excavation	m^3	59,800	180	11
1.3 Concrete	m^3	845,000	3,930	3,321
1.4 Miscellaneous (15% of the above)	LS	□	□	540
2. Compensation	LS	□	□	0
3. Eng. Services and Admi. (15% of Item 1)	LS	□	□	620
4. Contingency (15% of the above)	LS	□	□	714
Total		□	□	5,472

The annual maintenance cost is assumed to be 0.1% of the construction cost.

5.3.5 Recommendation of Further Study

The sabo works plan mentioned above has been formulated at a preliminary level on the basis of the limited information and field reconnaissance. The further data collection and analysis, intensive field reconnaissance and detailed study are recommended for the formulation of detailed sabo works plan and immediate implementation of the plan.

A study to excavate the river deposits accumulated in the river course upstream of the Magat reservoir should be made, so that the deposit will not flow into the reservoir.

5.4 Supporting Program

Illegal tree cutting and slash and burn activities are major problems in terms of forest conservation. Many efforts have been made by the Government to solve these problems, however these are still remained unsolved. The intensive survey on these activities, analysis of causes and effects, and study of efficient countermeasures should be conducted in order to preserve the existing and future watersheds. Consideration of residents' livelihood is the most essential.

Tables

Table 4.1.1 List of DENR Regular Reforestation Projects (1/2)

Name of Project	Location	Year Estab-lished	Project Area (ha)	Total Accomplish-ment (As of 1991) (ha)	Remaining Area to be Planted	Species Planted	Year Planted	Status
CAR								
GRAND TOTAL			**111,143**	**14,307**	**95,565**			
Mountain Province								
Lone Congressional District								
1 Bamboo Pilot Pltn. Project	Paracelis	1987	86	38	48	Almaciga, Gmelina, Narra	1987-1991	
2. Cabunagan Gate Refo. Project	Tadian	1937	23,674	4,597	19,077	Benguet Pine, Mahogany, Alnus	1937-1990	
3. Mt. Data Refo. Project	Bauko	1979	10,432	2,584	7,848	Narra, Agoho, Aklen Parang	1979-1991	
4. Buringal Refo. Project	Paracelis	1991	2,500	75	2,425	Agoho, Benguet Pine, Bagras	1991-1991	
TOTAL			**36,692**	**7,294**	**29,398**			
Kalinga-Apayao								
Lone Congressional District								
1. Tabuk Refo. Project	Tabuk	1986	1,320	342	978	Gmelina, Mahogany, Talisai	1986-1991	
2. San Gregorio Refo. Project	Luna	1991	70	70	0	Alnus, Teak, Japanese Acacia	1991	
3. Pinukpuk Refo. Project	Pinukpuk	1991	70	70	0	Benguet Pine, Alnus, Gmelina	1991	
TOTAL			**1,460**	**482**	**978**			
Ifugao								
Lone Congressional District								
1. Upper Magat Refo. Project	Potia, Lagawe Kianga. Mavovao	1976	41,087	5,995	35,092	Mahogany, Narra, Teal	1976-1989	
2. Bahawit Refo. Project		1974	2,000	82	1,918	Agoho, Almaciga, Akleng Parang	1974-1991	
3. CTF PD 209 Lagawe		1973	200	18	182	Benguet Pine, White Lauan, Agoho	1975-1991	
4. Aguinaldo Refo. Project		1981	10,571	72	10,499	Alnus, Talisai, Bagras	1981-1991	
5. CTF PD 209 Aguinaldo		1981	500	24	476	Bagras, Rain-tree, B.pine	1981-1991	
6. Potia Refo. Project		1980	3,280	77	1,932	Gmelina, Narra, Alnus	1980-1991	
7. Lamut		1984	2,000	68	1,932	Narra, Rain tree, Teak	1984-1991	
8. Banawe		1974	9,024	117	8,907	Talisai, B.Pine, Narra	1974-1991	
9. Mayoyao		1970	4,329	78	4,251	Rain-tree, Alnus, Mahogany	1970-1991	
TOTAL			**72,991**	**6,531**	**65,189**			
REGION2								
GRAND TOTAL			**82,950**	**53,472**	**29,478**			
Batanes								
Lone Congressional District								
1. Batanes Refo. Project	Basco	1986	3,643	89	3,554	Mahogany, Gmelina, Teak, Tindalo	1986-1990	
TOTAL			**3,643**	**89**	**3,554**			
Cagayan								
1st Congressional District								
1. Baggao Refo. Project	Assassi Baggao	1989	1,770	80	1,690	Narra, Rain-tree, Talisai, Yakal	1989-1990	
2. Nasiping Refo. Project	Gattaran	1939	2,011	2,011	0	Narra, Gmelina, Mahogany, Talisai	1939-1991	
TOTAL			**3,781**	**2,091**	**1,690**			
Cagayan								
3rd Congressional District								
1. Callao Refo. Project	Penablanca	1937	10,102	3,882	6,220	Gmelina, Teak, Narra, Mahogany	1937-1991	
2. Faire Refo. Project	Faire	1965	3,543	2,240	1,303	Mahogany, Yakal, Teak, Rain-tree	1965-1991	
3. Solsona Refo. Project	Solsona	1978	8,249	4,069	4,180	Mahogany, Teak, Japanese Acacia	1978-1991	
TOTAL			**21,894**	**10,191**	**11,703**			
Nueva Vizcaya								
Lone Congressional District								
1. Baysovilla Refo. Project	Bayombong	1986	3,966	424	3,542	Narra, Mahogany, Teak	1985-1991	
2. Consuelo Refo. Project	Sta Fe	1939	11,664	11,664	-	Mahogany, Teak, Narra	1939-1991	
3. Dupax Refo Project including Balance-Ganao & Kasibu Reforestation Project	Dupax del Norte	1976	2,131	2,131	-	Narra, Teak, Mahogany, Talisai	1976-1991	
4. Lower Maga Refo. Project	Diadi	1938	20,050	14,111	5,939	Mahogany,Gmelina,Palosanto,Yakal	1939-1991	
5. Salinas Refo Project	Bambang	1931	5,318	5,318	-	Narra,Mahogany,Alibangbang,Teak	1931-1991	
TOTAL			**43,129**	**33,648**	**9,481**			

Table 4.1.1 List of DENR Regular Reforestation Projects (2/2)

Name of Project	Location	Year Estab-lished	Project Area (ha)	Total Accomplish-ment (As of 1991) (ha)	Remaining Area to be Planted	Species Planted	Year Planted	Status
Isabela								
1st Congressional District								
1. Liwanag Refo. Project	Tumauini	1969	3,906	3,906	-	Teak, Narra, Tindalo, Rain-tree	1967-1991	
2. Tallag Refo. Project	Cabagan	1989	1,042	146	896	Mahogany, Talisai, Narra, Alibangbang		
TOTAL			**4,948**	**4,052**	**896**			
Isabera								
2nd Congressional District								
1. Mallig Refo. Project	Roxas	1989	1,000	93	907	Gmelina, Mahogany, Teak, Yakal	1989-1991	
TOTAL			**1,000**	**93**	**907**			
Isabela								
4th Congressional District								
1. Isabela Integrated Forestry Project	Ramon	1987	1,000	205	795	Mahogany, Narra, Teak, Palosanto	1987-1991	
TOTAL			**1,000**	**205**	**795**			
Quirino								
Lone Congressional District								
1. Maddela Refo. Project	Abbag Nagtipunan	1972	3,555	3,103	452			
TOTAL			**3,555**	**3,103**	**452**			

Source: DENR

Table 4.1.2 CBFM Projects in CAR and Region 2 (1/7)

P/C	PROJECT NAME	LOCATION	NAME OF PO	TOTAL AREA	TENURE AREA	CURRENT MEMBER-SHIP	PO CHAIRMAN	NO. OF BEN.	NO OF HH
	GRAND TOTAL	**305**		**630,677.41**	**393,749.07**	**7,304**		**72,568**	**4,257**
	CORDILLERA ADMINISTRATIVE REGION (CAR	**202**		**403,052.60**	**393,749.07**				**4,257**
	APAYAO	21		108,316.51	107,696.24				977
	Lone	21		108,316.51	107,696.24				977
1	San Jose I SF			510.00	510.00				0
2	Dona Loreta-Swan Refo Subproject			386.00	0.00				0
3	El eazar I SF			179.00	179.00				0
4	Karikitan I SF			350.00	350.00				0
5	Zumiqui I SF			91.00	91.00				0
6	Sta. Marcela I SF			221.00	221.00				0
7	Sta. Filomena I SF			85.00	85.00				0
8	Guina-ang I SF			110.00	110.00				0
9	Paddaoan I SF			241.00	241.00				0
10	Lenneng I SF @			200.00	200.00				0
11	Laco I SF			200.00	200.00				0
12	Naguilian I SF			80.00	80.00				0
13	Calanasan CBFM			585.24	585.24				98
14	Lenneng Kabugao CBFM			1,143.00	1,143.00				254
15	Sn Jose. Pudtol Refo Project			233.64	0.00				0
16	Abulog Watershed RRMP			2,080.00	2,080.00				481
17	Butao I SF			85.00	85.00				0
18	Conner I SF			473.63	473.00				144
19	Kabugao CADC			83,900.00	83,900.00				0
20	Tangl agan I SF			383.00	383.00				0
21	Conner CADF			16,780.00	16,780.00				0
	IFUGAO	56		62,199.51	57,170.98				514
	Lone	56		62,199.51	57,170.98				514
1	Ngileb I SF			132.00	132.00				0
2	Kiangan CADC			20,419.00	20,419.00				0
3	Ambasa I SF			133.00	133.00				0
4	Nunhabatan W'shed Rehab. CBFM			241.00	241.00				186
5	Bannao W'shed Rehab CBFM			199.00	199.00				76
6	Asipulo I SF			178.51	176.98				74
7	Mayoyao Watershed Subproject			2,000.00	0.00				0
8	Lamut Watershed Subproject			3,027.00	0.00				0
9	Ibulao Watershed RRMF			760.00	760.00				178
10	Tinoc CADC			27,787.00	27,787.00				0
11	Fourteen I SF			170.00	170.00				0
12	Dilan I SF			881.00	881.00				0
13	Regimental I SF			327.00	327.00				0
14	Bayninan I SF			47.00	47.00				0
15	Huebong I SF			446.00	446.00				0
16	Palao, Duit I SF			81.00	81.00				0
17	Pacco I SF			1,028.00	1,028.00				0
18	Pieza I SF			68.00	68.00				0
19	Little Tadian, A. Lista I SF			420.00	420.00				0
20	Danghav & Lana I SF			129.00	129.00				0
21	Amdugtong I SF			10.00	10.00				0
22	Pavong I SF			115.00	115.00				0
23	Lucban I SF			39.00	39.00				0
24	Mongavang I SF			180.00	180.00				0
25	Manaot I SF			75.00	75.00				0
26	Bul de Pinto I SF			236.00	236.00				0
27	San Quintin A. Lista I SF			129.00	129.00				0
28	San Jose A.Lista I SF			493.00	493.00				0
29	Banguil Ubao I SF			10.00	10.00				0
30	Boliwong I SF			234.00	234.00				0
31	Rosenda A. Lista I SF			89.00	89.00				0
32	Cabulungan I SF			20.00	20.00				0
33	Pabalay I SF			192.00	192.00				0
34	Palagtu I SF			314.00	314.00				0
35	Maitab I Sf			53.00	53.00				0
36	Bolinaonao I SF			53.00	53.00				0
37	Bul de I Sf @			36.00	36.00				0
38	Battalion I SF			82.00	82.00				0
39	Nakkedan I SF			28.00	28.00				0
40	Catobangan I SF			219.00	219.00				0
41	L. Tadian I SF			194.00	194.00				0
42	Maitab I SF @			20.00	20.00				0
43	Luta I SF			98.00	98.00				0
44	Naganacan I SF			31.00	31.00				0

Table 4.1.2 CBFM Projects in CAR and Region 2 (2/7)

P/C	PROJECT NAME	LOCATION	NAME OF PO	TOTAL AREA	TENURE AREA	CURRENT MEMBER-SHIP	PO CHAIRMAN	NO. OF BEN.	NO OF HH
45	Halag Ubao I SF			67.00	67.00				0
46	Bilibid I SF			47.00	47.00				0
47	Mapapi I SF			126.00	126.00				0
48	Busilak I SF			9.00	9.00				0
49	Bangui I SF			68.00	68.00				0
50	Lubuan I SF			6.00	6.00				0
51	Banting I SF			41.00	41.00				0
52	Admuntong I SF			34.00	34.00				0
53	Mabasal I SF			31.00	31.00				0
54	Butac I SF			41.00	41.00				0
55	Baquinge I SF			180.00	180.00				0
56	Malalupa I SF			126.00	126.00				0
	KALINGA	52		135,132.58	132,661.01				2,081
	Lone	52		135,132.58	132,661.01				2,081
1	Taloctoc I SF			118.00	118.00				0
2	Romual dez. Rizal Kalinga			2,500.00	361.80				146
3	Ammascian CBFM			1,023.08	1,023.08				366
4	Cawagayan-Mapaco W'shed Rehad CBFM			195.16	195.16				302
5	Liwan West Refc			333.37	0.00				475
6	Dacalan I SF			5.00	5.00				0
7	Sisim I SF @			54.00	54.00				0
8	Bagbag I SF			256.00	256.00				0
9	Dupligan I SF			69.00	69.00				0
10	Livang I SF			58.00	58.00				0
11	Seet I SF			31.00	31.00				0
12	Alinanag I SF			7.00	7.00				0
13	Cudal I SF			23.00	23.00				0
14	Sisim Laguindav I SF			451.00	451.00				0
15	Lobo I SF			10.00	10.00				0
16	Chico-Saltan Watershed RRMP			5,712.00	5,712.00				792
17	Pangol I SF			21.00	21.00				0
18	Buluan I SF			124.97	124.97				0
19	Tinglayan CADC			22,975.00	22,975.00				0
20	Balbalan CADC			55,030.00	55,030.00				0
21	Tanudan CADC			40,762.00	40,762.00				0
22	Pinococ I SF			114.00	114.00				0
23	Balatoc. Locog I SF			25.00	25.00				0
24	Marallag, Calaca I SF			79.00	79.00				0
25	Nambucayan I SF			53.00	53.00				0
26	San Carlos I SF			244.00	244.00				0
27	Bolo. Agbannawa I SF			24.00	24.00				0
28	Bantav I SF			10.00	10.00				0
29	Magaogao I SF			112.00	112.00				0
30	Mabalbalanay I Sf			116.00	116.00				0
31	San Pedro I SF			328.00	328.00				0
32	Pagogo, Dupliga I Sf			360.00	360.00				0
33	Malagnat I SF			261.00	261.00				0
34	Mapaco I SF			2,069.00	2,069.00				0
35	Cabetayan I SF			97.00	97.00				0
36	Liplipoken I SF			86.00	86.00				0
37	Sucbot I SF			71.00	71.00				0
38	Malalao I SF			33.00	33.00				0
39	Macutav I SF			170.00	170.00				0
40	Santor I SF			126.00	126.00				0
41	Bulbol I SF			1.00	1.00				0
42	Busol Liwan West I SF			62.00	62.00				0
43	Kapegan I SF			57.00	57.00				0
44	Nagabangon I Sf			33.00	33.00				0
45	Guilavon I SF			68.00	68.00				0
46	Camalog I SF			160.00	160.00				0
47	Nalbuan I SF			425.00	425.00				0
48	Tanjok, Calanan I SF			12.00	12.00				0
49	Calanan I SF			21.00	21.00				0
50	Calafug I SF			100.00	100.00				0
51	Lanna I SF			6.00	6.00				0
52	Tuliao I SF			51.00	51.00				0
	MOUNTAIN PROVINCE	73		97,404.00	96,220.84				685
	Lone	73		97,404.00	96,220.84				685
1	Balikian I SF			10.00	10.00				0
2	Lasad I SF			10.00	10.00				0
3	Maducavan I SF			15,439.00	15,439.00				0
4	Busa I SF			10.00	10.00				0
5	Poblacion Sabangan I SF			10.00	10.00				0
6	Capinitan I SF			10.00	10.00				0
7	Supang I SF			10.00	10.00				0
8	Tambingan I SF			10.00	10.00				0
9	Antadao I SF			315.00	315.00				0
10	Bao-angan I SF			10.00	10.00				0
11	Lias I SF			110.00	110.00				0

Table 4.1.2 CBFM Projects in CAR and Region 2 (3/7)

P/C	PROJECT NAME	LOCATION	NAME OF PO	TOTAL AREA	TENURE AREA	CURRENT MEMBER-SHIP	PO CHAIRMAN	NO. OF BEN.	NO OF HH
12	Kanluran I SF			76.00	76.00				0
13	Natonin CBFM			483.16	483.16				0
14	Poblacion Bontoc I SF			92.00	92.00				0
15	Balaoa I SF			10.00	10.00				0
16	Batique, Bangdan I SF			22.00	22.00				0
17	Mangar I SF			15.00	15.00				0
18	Tong-ab FLMA			5.00	5.00				0
19	Ober I SF			6.00	6.00				0
20	Amoloc I SF			10.00	10.00				0
21	Bananao I SF			10.00	10.00				0
22	Kayan West I SF			10.00	10.00				0
23	Bayyo, Malibcong I SF			293.00	293.00				0
24	Besao CADV			17,361.00	17,361.00				0
25	Mt. Data Watershed RRMP			664.00	664.00				91
26	Bunga CBFM			497.00	497.00				0
27	Tadian CADC			14,258.00	14,258.00				0
28	Tetep-an I SF			10.00	10.00				0
29	Saliok, Tappo I SF			10.00	10.00				0
30	Balango I SF			110.00	110.00				0
31	Sagada CADC			8,698.00	8,698.00				0
32	Guisadan, Suvo I SF			10.00	10.00				0
33	Barong Bananac			28.00	28.00				0
34	Masla I SF			10.00	10.00				0
35	Lubon West I SF@			10.00	10.00				0
36	Lacam-an I SF			275.00	275.00				0
37	Besao East I SF			57.00	57.00				0
38	Baguitan I SF			394.00	34.00				0
39	Suyo I SF@			74.00	74.00				0
40	Kilong I SF			107.00	107.00				0
41	Butigue I SF			50.00	50.00				0
42	Otucan I SF			89.00	89.00				0
43	Pangal I SF			10.00	10.00				0
44	Data I SF			10.00	10.00				0
45	Nebattang I SF			16.00	16.00				0
46	Labay I SF			51.00	51.00				0
47	Poblacion Paracelis I SF			167.00	167.00				0
48	Barlig CADC			34,326.00	34,326.00				0
49	Sabangan I SF			168.00	33.82				217
50	Pasnadan Refo CBFM			195.23	195.23				0
51	Kiltep-an Refo Subproject			298.98	0.00				377
52	Buringal Refo Subproject			390.00	0.00				0
53	Lubon Refo CBFM			393.63	393.63				0
54	Binanho I SF			4.00	4.00				0
55	Banawel I SF			19.00	19.00				0
56	Categan I SF			10.00	10.00				0
57	Banguitan I SF			394.00	394.00				0
58	Napua I SF			158.00	158.00				0
59	Maligcong I SF			184.00	184.00				0
60	Mainit I SF			84.00	84.00				0
61	Bay-yo I SF@			109.00	109.00				0
62	Alab Oriente I SF			103.00	103.00				0
63	Maba-av I SF			108.00	108.00				0
64	Poblacion, Barlig I SF			44.00	44.00				0
65	Poblacion Tadian I SF			259.00	259.00				0
66	Tonglayan I SF			2.00	2.00				0
67	Sumadel I SF			10.00	10.00				0
68	Saliok, Aromata I SF			33.00	33.00				0
69	Saliok, Mangnao I SF			15.00	15.00				0
70	Banna, Maducayan I SF			26.00	26.00				0
71	Banao, Besao I SF			10.00	10.00				0
72	Banao Bauko I SF			10.00	10.00				0
73	Lagawa, Tagapa I SF			108.00	108.00				0
	REGION	**103**		**227,624.81**		**7,304**		**72,568**	
	CAGAYAN	23		99,283.48		2,361		31,198	
	1ST DISTRICT	10		56,110.48		1,436		22,525	
CENRO ALCALA		**7**		**42,555.48**		**1,255**		**11,595**	
1	Bitag Grande	Assassi, Bitag Grande, Mocag, Mabini of Baggao & Dadda of Amulung, Cagayan	Cagayan Valley Resources Developers & Protectors Federation	3,778.17		839	Leonardo Salud	8,145	
2	Peñaweste	Peñawest, San Carlos, Banga-tan, capisayan, San Vicente Abra, Tanglagan & Mabno, Gattaran	Gattaran Earth Savers Cooperative, Inc.,	6,500.00		51	Benjamin Vicente	1,000	
3	Camunayan	Mansarong, Camunayan, Tabugan & Valley Cove	New Land Resources Developers Coop., Inc.,	5,500.00		118	Solomon Jurado	1,000	
4	Hacienda Intal	Hacienta Intal, Awallan & Asinga via Baggao	Intal, Awallan & Asinga via MPCI	9,465.00		53	Arman Bangayan	1,000	

Table 4.1.2 CBFM Projects in CAR and Region 2 (4/7)

P/C	PROJECT NAME	LOCATION	NAME OF PO	TOTAL AREA	TENURE AREA	CURRENT MEMBER-SHIP	PO CHAIRMAN	NO. OF BEN.	NO OF HH
5	Sta. Margarita	Sta. Margarita, Pallagao, Versoza, Baggao	Three Diamond MPCI	5,025.00		101	Wilson Leonillo	450	
6	Ragarag, Remus	Ragarag, Remus, Baggao	Re-al Upland Farmers MPCI	162.31		45	Milagros Perus		
7	Bolos Point	Bolos Pt., Gattaran	Bolos Pt. Community MPCI	12,125.00		48	Marcos Echanique		
CENRO APARRI		**3**		**13,555.00**		**181**		**10,930**	
1	Sta. Ana	Rapuli & Casambalangan, Sta. Ana, Cagayan	Casambalangan Rapuli MPCI	4,880.00		95	Domingo Ganno	4,930	
2	Gonzaga	San Jose, Sta. Maria	San Jose, Sta. Maria, Cabiraoan MPCI	8,375.00		35	Ruben Naidas	6,000	
3	Felipe Tuzon	Felipe Tuzon, Camalaniugan, Cagayan	Dammang CBFM, MPCI	300.00		51	Jayson Soriano		
	2ND DISTRICT	6		27,820.00		522		5,232	
CENRO PIAT		**4**		**10,325.00**		**302**		**3,432**	
1	Sicalao	Peru & Sicalao, Lasam, Cag.	PERLASCA MPCI	4,200.00		41	Dominador Morales	2,448	
2	Sta. Felicitas	Tamucco & Sta. Felicitas, Sto. Niño, Cagayan	CFP Cooperative, Inc.	5,000.00		81	Jose Tapaoan	984	
3	Lipatan, Sto. Niño	Lipatan, Sto. Niño, Cagayan	Lipatan Upland Farmers Cooperative, Inc.,	300.00		50	Delia Callo		
4	Allacapan	Dalayap, San Juan & Tubel, Allacapan, Cagayan	Allacapan Agri-forest Dev't Coop.	825.00		130	Severino Tagaca		
CENRO SANCHEZ MIRA		**2**		**17,495.00**		**220**		**1,800**	
1	Sanchez Mira	Kittag, Langagan, Santiago & Bangan, Sanchez Mir;	Sanchez Mira Forest Developers Ass'n Inc.,	8,765.00		78	David Pablo	600	
2	Malilitao	Malilitao. Sto. Tomas, Sto. Niño, Luzon & Tabbugan, Claveria	Southern Claveria ForeeSt Resources Developers Ass'n., Inc.,	8,730.00		142	Romualdo Libed	1,200	
	3RD DISTRICT	7		15,353.00		403		3,441	
CENRO PENABLANCA		**7**		**15,353.00**		**403**		**3,441**	
1	Quibal	Quibal, Buyun, Nanguillatan & Nabbabalayan, Peñablanca, Cagayan	Quibal MPCI	4,170.00		52	Marilyn Taguinod	1,151	
2	Bulagao	Bulagao, Tuao, Cagayan	Bulagao Forest Land Managers Ass'n, Inc.,	600.00		100	Severino Bucayu		
3	Cabasan	Cabasan, Peñablanca, Cagayan	Cabasan Soil Tillers MPCI	252.00			Carlito Malonga	580	
4	Lapi, Peñablanca	Lapi, Peñablanca, Cagayan	Lapi Upland Farmers MPCI	10,000.00		51	Jarvish Sibbaluca		
5	Gosi CPEU	Gosi, Tugugarao, Cagayan	Gosi Upland Farmers MPCI	163.00		60		360	
6	Bical Refo	Bical, Peñablanca, Cagayan	Watershed Conservations & Developers MPCI	84.00		50	Romeo Pagulayan	1,350	
7	Baliuag Refo	Baliuag, Peñablanca, Cagayan	Baliuag Progressive MPCI	84.00		90	T. Paraggua		
	ISABELA	19		45,697.18		1,590		29,053	
	1ST DISTRICT	7		28,473.00		964		14,192	
CENRO CABAGAN		**6**		**23,473.00**		**829**		**14,192**	
1	Masipi East	So. Puerto, Masipi East, Cabagan, Isabela	Masipi East MPCI	5,000.00		267	Wilson Uberita	1,602	
2	San Pablo	Limbauan, Simaru Sur/Norte, San Vicente & Dalena,	San Pablo Agroforestry MPCI	11,470.00		250	Quirina Curibang	6,285	

Table 4.1.2 CBFM Projects in CAR and Region 2 (5/7)

P/C	PROJECT NAME	LOCATION	NAME OF PO	TOTAL AREA	TENURE AREA	CURRENT MEMBER-SHIP	PO CHAIRMAN	NO. OF BEN.	NO OF HH
3	Tumauini	Caligayan & Antagan I, Tumauini, Isabela	Tumauini Agroforestry MPCI	6,425.00		70	Macario Romero	5,009	
4	Masipi West	Masipi West, Cabagan	Masipi West Sinamar Ass'n	165.00		55	Modesto Galapon	360	
5	Dy-Abra	Dy-Abra Tumauini, Isabela	Sierra Madre Greeners Ass'n	373.00		77	Marieto Banao	276	
6	Camasi Norte	Camasi Norte, Tumauini, Isabela	Camasi Silnag Ass'n	40.00		110	Romeo Acoba	660	
CENRO PALANAN		**1**		**5,000.00**		**135**		**0**	
1	Maconacon	Aplaya, Canadan, Reina Mercedez, Maconacon	Aplaya, Canadan, Reina Mercedez MPCI	5,000.00		135	German Subia		
	2ND DISTRICT	4		11,121.18		372		10,678	
CENRO NAGUILIAN		**4**		**11,121.18**		**372**		**10,678**	
1	Rang-ayan	Rang-ayan, Batong-Labang, Villa Imelda & Nanaguan, Ilagan	VIBANARA MPCI	10,210.18		104	Romeo Obedoza	8,794	
2	Binatug	Binatug, Sn. Mariano, Isabela	Binatug Refo. MPCI	540.00		120	Jesus Cureg	1,350	
3	Nanaguan	Nanaguan, Ilagan, Isabela	Nanaguan MPCI	198.00		90	Salvador Cafirma		
4	Salindingan	Salindingan, Ilagan, Isabela	Salindingan ISF MPCI	173.00		58	Danny Adorable	534	
	3RD DISTRICT	1		5,000.00		51		1,250	
CENRO CAUAYAN		**1**		**5,000.00**		**51**		**1,250**	
1	San Guillermo	Rizal & Burgos, San Guillermo	Rizal Integrated Dev't MPCI	5,000.00		51	Marcelino Agliam	1,250	
	4TH DISTRICT	7		1,103.00		203		2,933	
CTNTRO SAN ISIDRO		**7**		**1,103.00**		**203**		**2,933**	
1	Villa Mieban	Villa Mieban, Cordon, Isabela	Villa Mieban Green Up-land Farmers Ass'n	140.00		34	Cipriano Ticuman	1,218	
2	Dapiz	Dapiz, San Agustin, Ssabela		450.00		35		5	
3	Taleb CPEU	Taleb, Dallao, Cordon, Isabela	Taleb Upland Farmers MPCI	203.00		113	Donato Andres	1,578	
4	Bunig	Anonang, Cordon, Isabela	Bunig-Agroforestry Developers Ass'n	50.00		21	Raymundo Costales		
5	Anonang	Anonang, Cordon, Isabela	Anonang Agroforestry Environmentalist, Inc.,	60.00				132	
6	Wigan	Wigan, Cordon, Isabela	Wigan Agroforestry Developers Organization	100.00					
7	Gawed	Gawed, Anonang, Isabela	Gawed Upland Farmers Ass'n	100.00					
	NUEVA VIZCAYA	23		14,688.32		1,231		3,033	
	LONE	23		14,688.32		1,231		3,033	
PENRO BAYOMBONG		**8**		**8,484.82**		**568**		**2,487**	
1	Dagupan	Dagupan, Quezon	Socio-Economic & Environtal Dev't, Coop. Inc.,	2,200.00		170	Felix Mendoz		
2	Vista Hills, Buenavista	Buenavista, Bayombong, Nueva Vizcaya	Federation of Vista Hills, Kalongkong & Kakilingan Upland Farmers, Ass'n Inc.,	3,000.00		177	Virgilio Perez		
3	SK Balete	Balete, Diadi	SK Balete Incorporated	202.00		115	Consuelo Perez		
4	Ambaguio	Tiblac, Ambaguio	Ambaguio Upland Environtalist Ass'n Inc.,	2,222.00				615	
5	Señara Falls CFSA	Bansing, Bayombong	Señora Falls Upland Farmers Ass'n	490.00				1,872	
6	Singian	Tuao South, Bagabag, Nueva Vizcaya	Singian Agro-Forest Ass'n	84.82		62	Arsenio Diaz		

Table 4.1.2 CBFM Projects in CAR and Region 2 (6/7)

P/C	PROJECT NAME	LOCATION	NAME OF PO	TOTAL AREA	TENURE AREA	CURRENT MEMBER-SHIP	PO CHAIRMAN	NO. OF BEN.	NO OF HH
7	Bagabag	Pogonsino, Bagabag, Nueva Vizcaya	Association of Upland Farmers of Singian N. Vizcaya	64.00		21	Benjamin Pablo		
8	Runruno	Dumaliguia, Runruno, Quezon, Nueva Vizcaya	Bakir Pagbiagan ti Pagilian CBFMA Ass'n	222.00		23	Ruby Andrada		
CENRO ARITAO		**9**		**4,395.50**		**441**		**546**	
1	Yaway	Yaway, Aritao	Yaway Farmers MPCI	1,287.00			Jerome Shog-oy	478	
2	Latar	Latar, Aritao	Latar Ilocano Minority Farmers Ass'n Inc.,	437.50		31	Rafael Sagpatan		
3	Aritao Refo.	Aritao, Nueva Vizcaya		50.00		25			
4	Kayapa Refo	Kayapa, Nueva Vizcaya	Kayapa Proper East Farmers Ass'n Inc.,	50.00		25	Ireno Pareño	68	
5	Balete CPEU	Balete, Sta. Fe, Nueva Vizcaya	Balete Upland Farmers MPCI	260.00		115			
6	Aritao CFSA	Bayagong, Canarem, Aritao	Bayagong Ass'n for Commuty Dev't Inc.,	1,213.00		54			
7	Unigold CFSA	Atingi, Beti, Aritao	Unigold Wordluck Cong., Inc.,	7.00		48			
8	Buyasyas	Buyasyas, Kayapa & Sta. Fe, Nueva Vizcaya	Buyas Iwak Tribal Council	1,021.00		120	Tony Lamsis		
9	Baliling	Baliling & Sinapaoan, Sta. Fe, N. Vizcaya	Cadagad Vegetable & Fruit Tree Growers Ass'n	70.00		23	Apolinario Sansano, Sr.		
CENRO DUPAX		**6**		**1,808.00**		**222**		**0**	
1	Alfonso Castañeda	Lublub, Alfonso Castañda, Nueva Vizcaya	JV Greeners Tree Planters Ass'n	80.00		32	Junifer I. Bautista		
2	Banila	Banila, Dupax des Sur, N. Viz.	Banila Community-Based Ass'n Inc.,	450.00		90	Isaac Liguigan		
3	Bitnong	Bitnong Munquia & Inaban	Bitnong Guijo Greeners Ass'n Inc.,	328.00		100	Florentino Hullana		
4	Mabasa	Mabasa, Dupax del Norte, N. Vizcaya	Mabasa Tree Planters Ass'n	20.00			Rene Vadil		
5	Alfonso Castañeda	Alfonson Castañeda, N. Vizcaya	Alfonso Castañeda Comm. Based Forest Mgt. Ass'n	880.00			Hilario Delizo		
6	CBFM-FLMA Mabasa	Mabasa, Dupax de Norte, N. Vizcaya	CBFM-FLMA Mabasa Agro-Forest Dev't. Ass'n	50.00					
	QUIRINO	32		67,485.83		1,922		8,745	
	LONE	**32**		**67,485.83**		**1,922**		**8,745**	
CENRO AGLIPAY		**20**		**39,078.00**		**884**		**8,014**	
1	Alicia	Alicia Sn Benigno & Nagabsaban, Aglipay	Alicia Sustainable Resources Dev't Cooperative	1,844.00		86	Eddie Tuwao	1,303	
2	San Manuel-Victoria	San Manuel & Victoria Aglipay	Sn Manuel-Victoria Forest Developers Coop.,	3,176.00		156	Rosendo Ramon, Jr.		
3	Balligui	Balligui & San Jose Ancheta	Balligui Comm. Forest & Dev't	4,400.00		98	Oscar P. Guliguey		
4	Villa Venture	Villa Venture, Aglipay, Quirino	Magalsing Upland Farmers MPCI	348.00		170	Ruby Mapalad		
5	Cabarroguis Refo	Cabarruguis, Quirino		50.00		25			
6	Villa Pagaduan	Pagaduan, Diffun, Quirino	Pagaduan Upland Farmers Ass'n Inc.,	3,500.00		46	Noel E. Uddi-E	578	
7	Pimentel Diffun	Pimentel, Diffun, Quirino	Pimentel Upland Developers Ass'n Inc.,	3,000.00		34	Ruben Pakiwon	662	
8	San Benigno	San Benigno, Aglipay, Quirino	San Benigno Sustainable Dev't Coop., Inc.,	2,300.00		41	Nicasio Bulahao	797	
9	Diffun Refo	Diffun, Quirinc		50.00		25			
10	Jose Ancheta	Jose Ancheta, Maddela, Quirino	Mataga-ey Sustainable Resources Dev't, Coop.,	3,600.00		38	Diosdado Estacapio	1,341	
11	San Dionisio	Sn. Dionisio, Maddela, Quirino	ces Dev't., Coop.,	5,350.00		49	Edwin Sardon	744	
12	Villa Gracia	Villa Gracia, Maddela, Quirino	Villa Gracia Sustainable Resources Dev't Coop.,	4,000.00		37	Juliver Dupingay	1,248	

Table 4.1.2 CBFM Projects in CAR and Region 2 (7/7)

P/C	PROJECT NAME	LOCATION	NAME OF PO	TOTAL AREA	TENURE AREA	CURRENT MEMBER-SHIP	PO CHAIRMAN	NO. OF BEN.	NO OF HH
13	San Martin	San Martin, Nagtipunan, Quirino	Sn Martin Farmers Ass'n	4,060.00		46	Paulino Lunag	871	
14	Villa Ylanan	Villa Yllanan, Maddela, Quirino	Natural Agricultural Resour	3,400.00		33		470	
15	Villa Agullana	Villa Agullana, Maddela, Quirino	Vill Agullana Tribal Dev. Organization						
16	Cabugao	Cabugao, Aglipay, Quirino	Cabugao Intersectoral Ass'n						
17	Diodol	Diodol, Aglipay, Quirino	Diodol Integrated Community Agroforest Dev't Ass'n						
18	Bumabel	Bumabel, Aglipay	Dumabel Upland Farmer Ass'n						
19	Pinaripad	Pinaripad Sur, Aglipay, Quirino	Pinaripad Sur Integrated Agroforest Ass'n						
20	Damsite	Damsite, San Leonardo, Aglipay, Quirino	Damsite Addalem Integrated Community Agroforest Dev't, Ass'n						
CENRO NAGTIPUNAN		**8**		**23,169.00**		**734**		**731**	
1	Kadikitan	Kadikitan, Landingan	Kadikitan Ass'n for Comm. Dev't	4,958.00		177	Peter Santos		
2	Asaklat	Asaklat, Nagtipunan	Nun-uh-uhaan Peoples Org'n	2,600.00		105	Renato Belen		
3	Wasid	Wasid, Nagtipunan	Wasid MPCI	6,420.00		59	Lozado Toloy		
4	Landingan	Landingan, Nagtipunan	Ilongot Livelihood Ass'n, Inc.,	1,752.00		67	Romeo Tiangson		
5	Anak	Anak, Nagtipunan	Anak Intercultural org'r	5,315.00		158	Benito Corpuz, Jr.		
6	Sangbay-Anak	Sangbay-Anak, Nagtipunan, Quirino	Sangbay-Anak Integrated Farmers Ass'n	104.00		76	Ricardo Gawid		
7	San Ramos	San Ramos, Nagtipunan, Quirino	Quirino Tribal Farmers Ass'n	1,400.00		54	Felix Leid	644	
8	Gomez	Gomez, Cabarroguis, Quirino	Gomez Farmers MPCI	620.00		38	Atonio Gonsay	87	
PENRO JURISDICTION		**4**		**5,238.83**		**304**		**0**	
1	Don Mariano	Don Mariano Perez, Diffun	Don Mariano Perez Farmers MCPI	3,100.00		135	Walter Dupinos		
2	Baguio Village	Baguio Village, Diffun	BICAS-Baguio Village Intercultural Ass'n, Inc.	1,990.00		137	Basanio Santil		
3	Ifugao Village	Ifugao Village, Diffun, Quirino							
4	Rafael	Rarael Palma, Diffun, Quirino	Rafael Palma MPCI	148.83		32	Rodolfo Lagunilla		
	BATANES	6		470.00		200		539	
1	Itbayat	Vato, Raele	Itbayat Integrated Area Dev't Program, Inc.,	390.00				100	
2	Radiwan CPEU	San Juan, Radiwan, Batanes	San Juan Nakurang ISF MPCI	20.00		50			
3	Mahatao Refo	Mahatao, Batanes	Mahatao Multi-Sectoral Ass'n, Inc.,	20.00		50	Eduardo Balasbas	156	
4	Ivana Refo	Ivana, Batanes	Ivana Multi-Sectoral Ass'n Inc.,	20.00		50	Jorge Castaño	160	
5	Uyugan Rero	Uyugan, Batanes	Uyugan Mini-Sectoral Ass'n, Inc.,	20.00		50	Daniel Bogador	123	
6	Mahatao & Uyugan	Mahatao, & Uyugan, Batanes							

Source: DENR

Table 4.2.1 Outline of Foreign Assisted Watershed Management Projects (1/4)

Project Name	Environment and Natural Resources-sectoral adjustment Loan Program(ENR-SECAL)	Forestry Sector Project (FSP)	Natural Resources Management Program □ - Forest Resources Management Component (NRMP-FRM)
Project Type	Institutional Building and Natural Resources Management	Reforestation/Watershed Rehabilitation & Forest Resources Development	Natural Resources Management
Project Duration	7 years (1991-1999)	7 years (1993-2000)	7 years (1995-2002)
Project Location	Ilocos Sur, Ilocos Norte, La. Union, Pangasinan, Region 1; Nueva Vizcaya, Quirino, Cagayan, Isabela, Batanes, Region 2; Palawan, Rizal, Region 4; Negros Occidental, R6; Negros Oriental, Cebu, Bohol R7; Western Samar, Eastern Samar, Northern Samar, Region 8; Zamboanga, Basilan, Tawi-Tawi, Region 9; Bukidnon, Misamis Oriental & Occidental, Region 10; Agusan, Surigao del Norte, Region 13; CAR Region (Benguet, Ifugao, Kalinga, Apayao, Abra and Mt. Province).	Nationwide	Region 2, 4, 5, 10, 11 and 13
Funding Agency	WB/International Bank for Rural Development (IBRD)	Japan Bank for International Cooperation (JDIC)	U.S. Agency for International Development (USAID)
Project Cost	ENR-SECAL INVESTMENT COMPONENTS RRMP - US$ 64,000,000 MEC - 14,200,000 IPAS - 22,200,000 US$101,000,000	US$ 100,000,000 (Total Forex : 75,000,000 Total Gop : 25,000,000)	US$ 43,338,000 (Total Forex : 38,814,000 Total Gop : 4,524,000)
Project Description		The project is being funded through an additional loan from JBIC formerly OECF to the Second ADB Forestry Sector Project Loan. Sub-project sites will be selected from all over the country. The project will focus on sites that are adjacent to and/or supportive of other JBIC investments such as irrigation systems, water impoundment, hydroelectric power and other energy-related projects.	The NRMP was formally signed and agreed upon by the government of the Philippines and the U.S. Agency for International Development (USAID) on September 28, 1990 with the purpose of helping the DENR develop a policy environment conducive to ecologically sound and sustainable economic growth with special attention to tropical forests, biodiversity and forest products industry.

Table 4.2.1 Outline of Foreign Assisted Watershed Management Projects (2/4)

Project Name	Philippine - German Community Forestry Project - Quirino (CFPQ)	Quirino Community-Based Forestry Program : A Debt-For-Nature Swap Initiative (DFNSI)
Project Type	Plantation Development (Community - Based Forest Management)	Biodiversity Conservation
Project Duration	10 years (1992-2001)	4 years (1998-March 2002)
Project Location	Municipality of Nagtipunan, Quirino Brgy. Asaclat, Anak Municipality of Diffun Brgy. Baguio Village, Don Mariano Perez Municipality of Maddela Brgy. Villa Agullana	Quirino Province (10 barangays in the municipalities of Maddela, Nagtipunan, Aglipay and Diffun)
Funding Agency	German Agency for Technical Cooperation (GTZ) German Agency for Financial Cooperation (KFW) Provincial Government of Quirino	KfW (Financing Cooperation Agency of the Federal Republic of Germany)
Project Cost	US$ 8,589,000 (Total Fores : 7,563,000 Total Gop : 1,026,000)	Thirty per cent (30%) of the DM12,775,044.82 debt has been made available as debt conversion to implement the program. Peso cost shall depend of the prevailing foreign currency exchange rate. (GOP Counterpart sourced from Special Project Fund)
Project Description	The Project aims to bring about, through community participation and self-help a sustainable management of the natural resources-forest in particular-within the Project area. The Project, as its main strategy, facilitates the rural people's organization in planning, in mobilizing local resources and in implementing, monitoring and evaluating the community-initiated natural resource management programs. In addition, the Project aims to support institutional strengthening of partner organization (DENR, Local Government Units, NGOs, financial institution) in order that the latter sustain the Project efforts in the area and replicate them in other areas.	Debt-for-Nature-Swap has emerged primarily for the protection of environment and sustainable use of the natural resource base. This was implemented by the bilateral basis by means of the debt consolidation agreement of July 30, 1992, and the amended agreement of June 6, 1993 where by a total of DM 12,775,044.82 has been made available as debt conversion to implement projects for the protection and conservation of environment (Note Verbale 425/95). Taking advantage of this opportunity, the DENR proposed the Project "Quirino Community Based Forestry Program: A Debt-for-Nature Swap Initiative" covering ten (10) barangays in the municipalities of Maddela, Nagtipunan, Aglipay and Diffun.

Table 4.2.1 Outline of Foreign Assisted Watershed Management Projects (3/4)

FORESTRY SECTOR PROJECT - ADB
List of Approved Subproject Sites

Region	Type	Subproject Title	Subproject Location	Area for Dev't. (Ha)	Final Target (Ha)	Data of Approval
□	Refo	Nanaguan Reforestation Subproject	Nanaguan, Ilagan, Isabela	198.00	198.00	Sep. 2, 1994
	Refo	Banila Reforestation Subproject	Banila, Dupax del Sur, Nueva Vizcaya	220.00	220.00	Nov. 23, 1995
	Refo	Bitag Grande Reforestation Subproject	Brgy.Bitag Grande, Baggao, Cagayan	199.00	199.00	Mar. 15, 1995
	Refo	Bulagao Reforestation Subproject	Brgy.Bulagao, Tuao, Cagayan	415.00	415.00	May. 4, 1995
	Refo	Binatog Reforestation Subproject	Brgy.Binatog, Mun of San Mariano Isabela	572.00	540.00	Jan. 8, 1996
	Refo	Bitnong Reforestation Subproject	Brgys.Bitnong & Mungia, Dupax del Norte, Nueva Vizcaya	324.00	141.00	Feb. 5, 1996
	Refo	Balete Reforestation Subproject	Brgy.Balete, Diadi, Nueva Vizcaya	199.00	199.00	Feb. 5, 1996
	Refo	Sangbay Reforestation Subproject	Brgy.Sangbay, Nagtipunan, Quirino	279.60	104.00	May. 28, 1996
	Refo	Balungcanag Reforestation Subproject	Brgy.Balugcanag, Rizal, Cagayan	385.50	438.97	Sep. 30, 1996
		No. of Sites : 9	Sub-Total	2,792.10	2,454.97	
	WS	Dagupan Watershed Rehabilitation Subproject	Dagupan, Quezon, Nueva Viscaya	995.75	423.00	Sep. 30, 1996
		No. of Sites : 1	Sub-Total	995.75	423.00	
	CFP	Baggao CFP Sbuproject	Baggao, Cagayan	910.00	910.00	Sep. 2, 1994
	CFP	Masipi East CFP Subproject	Sitio Puerta, Masipi East, Cabagan, Isabela	994.00	258.10	Sep. 27, 1996
	CFP	VIVANARA CFP Subproject	Brgys.Villa Imelda, Batong Labang, Nanaguan and Rang-ayan, Isabela	997.00	826.62	Sep. 27, 1996
	CFP	Quibal CFP (Expansion) Subproject	Brgys.Buyun and Nababbalayan, Penabalanca, Cagayan	200.00	68.00	Sep. 27, 1996
	CFP	San Manuel - Victoria CFP Subproject	San Manuel, Victoria, Quirino	1,755.33	704.00	Sep. 30, 1996
	CFP	Kadikitan CFP Subproject	Kadikitan, Nagtipunan, Quirino	697.20	434.00	Sep. 30, 1996
		No. of Sites : 6	Sub-Total	5,553.53	3,200.72	
		Total No. of Sites : 16	**Total**	**9,341.38**	**6,078.69**	
CAR	Refo	Dona Loreta-Swan Reforestation Subproject	Brgys.Dona Loreta, Swan, and Lydia Pudtol, Kalinga-Apayao, CAR	386.00	25.00	May. 4, 1995
	Refo	Liwan West Reforestation Subproject	Brgy.Liwan West, Rizal, Kalinga Prov.	333.37	25.00	Sep. 30, 1996
	WS	Nunhabatan Watershed Rehabilitation Subproject	So.Nunhabatan, Brgy.Hapid, Lamut, Ifugao	241.00	25.00	Jul. 3, 1995
	WS	Bannao Watershed Rehabilitation Subproject	Brgy.Bannao, Municipality of Banawe, Ifugao Province	119.00	25.00	Sep. 4, 1995
	WS	Cawagayan-Mapaco Watershed Rehabilitation Subproject	Brgys.Mapaco and Cawagayan, Pinukpuk, Kainga	195.16	110.18	Mar. 1, 1996
	WS	Ammacian Watershed Rehabilitation Subproject	Ammacian - Taggay, Pinukpuk, Kalinga Province	1,023.07	290.00	Aug. 28, 1996
	CFP	Calanasan CFP Subproject	Brgys.Eva Puzon and Sta.Filomena, Calanasan, Apayao	585.24	89.50	Sep. 30, 1996
		No of Sites 7		**2,882.84**	**589.68**	

Table 4.2.1 Outline of Foreign Assisted Watershed Management Projects (4/4)

FORESTRY SECTOR PROJECT - OECF

List of Approved Subproject Sites

Region	Type	Subproject Title	Subproject Location	Area for Dev't.	Final Target	Data of
CAR	WS	Magat Watershed (Lamut and Mayoyao) Sub-Watershed	Bimpal, Jolowon, Nayon, Banao, Balangbang, Mayaoyao and Lamut, Ifugao	5,027.00	5,027.00	Aug. 26, 1996
		No. of Sites : 1	Sub-Total	5,027.00	5,027.00	
		No. of Sites : 1	Grand-Total	5,027.00	5,027.00	
□	WS	Magat Watershed (OECF) Dumayop Sub-Waershed	Beretbet, Bagabag, Nueva Vizcaya	2,973.00	2,973.00	Aug. 26, 1996
		No. of Sites : 1	Sub-Total	2,973.00	2,973.00	
		Total No. of Sites : 1	**Grand Total**	**2,973.00**	**2,973.00**	

Source: DENR

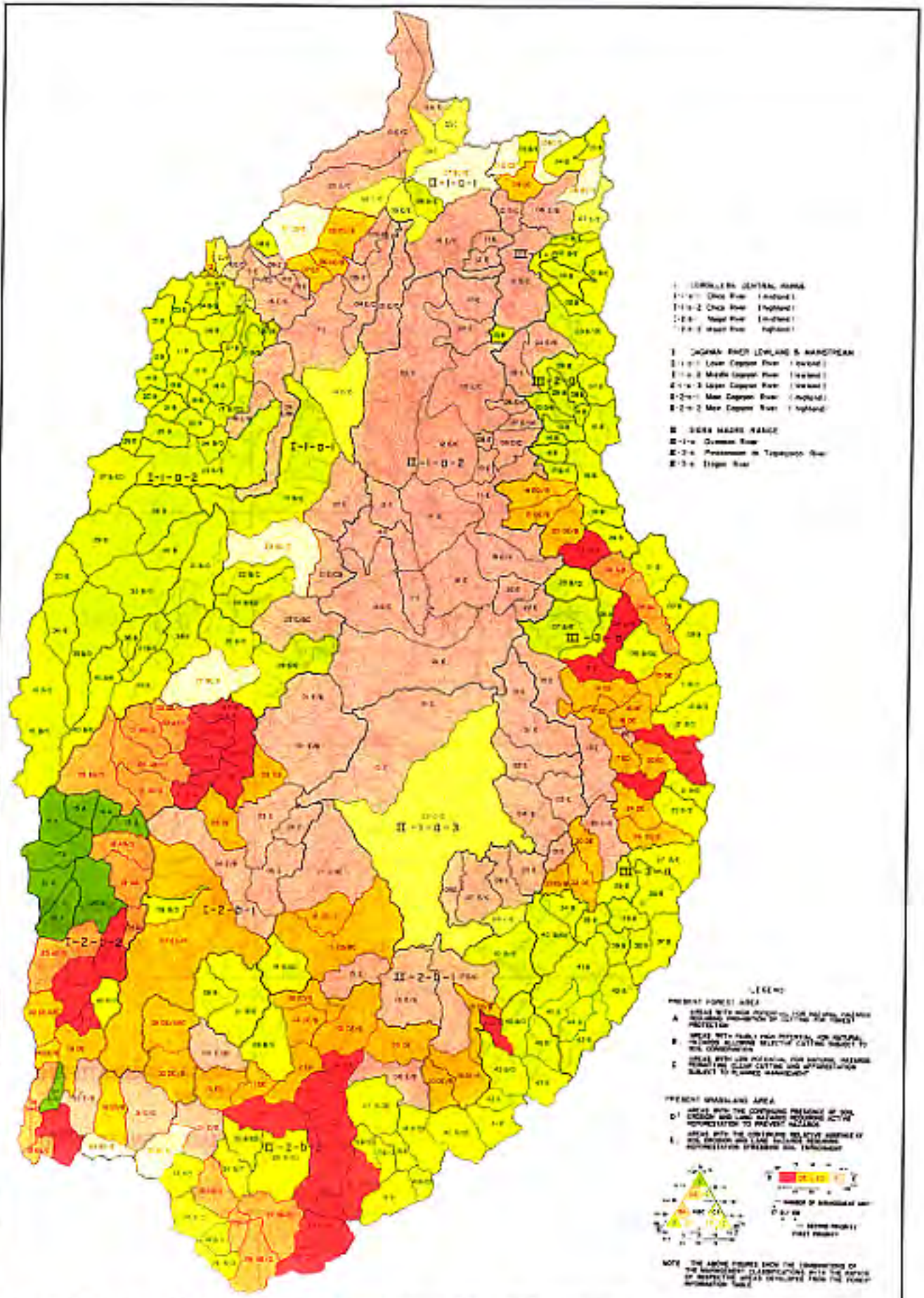
Table 5.2.1 Proposed Reforestation Area

No.	Forest Compatment	Catchment Area (Forest Register) (km^2) *1	Adjusted Catchemnt Area (km^2)*2	Forest Area (Forest Register) (km^2) *1	Adjusted Forest Area (km^2)*2	Land Area over 18% in slope		Forest Area in Land over 18% in slope			Area of Re-forestation after 1993 (km^2)	Agricultural Land over 18% in Slope (km^2)	Proposed Reforestat-ion Area (km^2)
						(%)	(km^2), X	(%)	(km^2), Y	Y/X			
1	0401	764.57	752	406.53	400	35	263	32	241	91%		19	4
2	0402	535.87	527	299.61	295	30	158	23	121	77%			37
3	0403	865.58	851	576.23	567	64	545	48	408	75%		41	95
4	0404	168.01	165	158.06	155	93	154	93	154	100%			0
5	0405	1,013.79	997	782.82	770	85	847	75	748	88%			100
6	0406	1,021.34	1,004	216.49	213	26	261	5	50	19%		2	209
7	0407	469.17	461	98.42	97	32	148	1	5	3%		5	138
8	0408	717.12	705	117.23	115	10	71	3	21	30%			49
9	0409	1,044.18	1,027	194.06	191	23	236	2	21	9%		6	210
10	0410	534.75	526	200.35	197	35	184	6	32	17%		4	148
11	0411	559.37	550	157.07	154	0	0	0	0	-			0
12	0412	519.94	511	139.21	137	0	0	0	0	-			0
13	0413	649.12	638	451.80	444	30	191	26	166	87%			26
14	0501	898.80	884	444.28	437	57	504	31	274	54%		27	203
15	0502	933.12	917	895.87	881	96	881	93	853	97%			28
16	0503	517.87	509	234.77	231	53	270	32	163	60%		27	80
17	0504	589.70	580	549.56	540	95	551	91	528	96%			23
18	0505	583.60	574	431.34	424	70	402	57	327	81%			75
19	0506	377.92	372	347.39	342	100	372	91	338	91%			33
20	0507	687.14	676	530.59	522	90	608	75	507	83%		2	99
21	0508	374.52	368	358.70	353	97	357	96	353	99%			4
22	0509	457.46	450	377.12	371	90	405	77	346	86%		5	53
23	0510	385.47	379	235.96	232	91	345	61	231	67%			114
24	0601	425.63	418	86.47	85	1	4	0	0	0%			4
25	0602	979.37	963	492.19	484	26	250	17	164	65%		51	36
26	0603	1,512.91	1,487	610.03	600	67	997	29	431	43%	13	23	529
27	0604	462.42	455	124.44	122	59	268	17	77	29%			191
28	0605	545.98	537	376.38	370	92	494	65	349	71%	7		138
29	0606	507.43	499	462.23	454	88	439	86	429	98%			10
30	0607	914.26	899	702.38	691	94	845	76	683	81%		15	147
31	0608	871.26	857	585.26	575	78	668	53	454	68%		7	207
32	0701	3,304.32	3,249	2,640.27	2,596	77	2,501	73	2,371	95%		112	18
33	0801	332.65	327	330.28	325	99	324	99	324	100%			0
34	0802	2,349.66	2,310	2,210.83	2,174	88	2,033	82	1,894	93%	8	1	130
35	0901	874.63	860	809.24	796	85	731	79	679	93%			52
	Total	27,748.93	27,281	17,633.46	17,336		17,304		13,742		28	347	3,188

Notes: *1; Forest Register prepared in 1995 by JAFTA, DENR, NAMRIA, and RSRDAD.

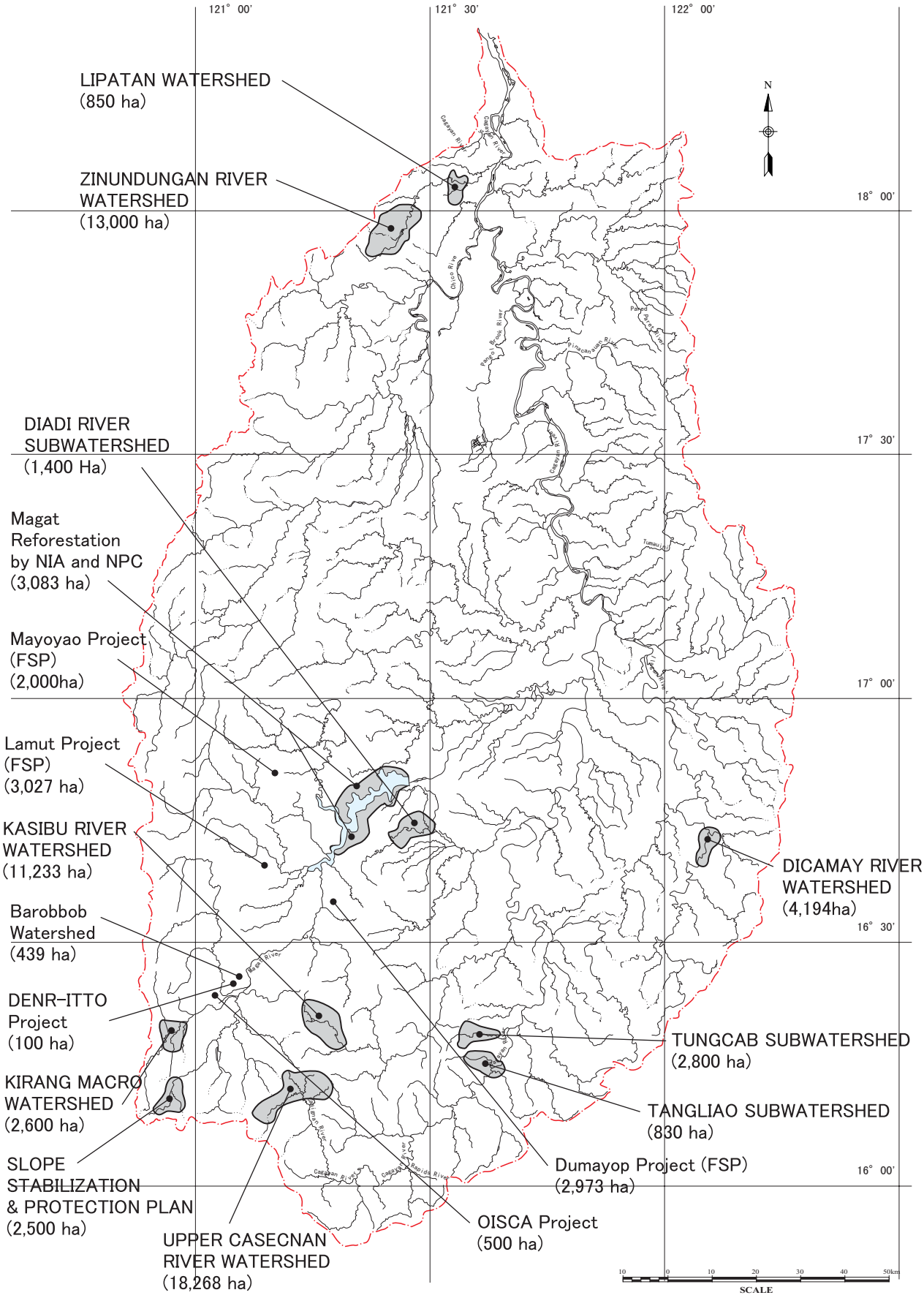
*2; Adjustment factor of 0.983 (=27,281/27,749) is introduced in the adjustment.

Figures



Source: Preparation of Forest Information in Wide Area and Forest Management Planning, JICA, 1988

The Feasibility Study of the Flood Control Project for the Lower Cagayan River in the Republic of the Philippines	**Figure 3.3.1**
JAPAN INTERNATIONAL COOPERATION AGENCY	**Forest Management Plan**



The Feasibility Study of the Flood Control Project for the Lower Cagayan River in the Republic of the Philippines

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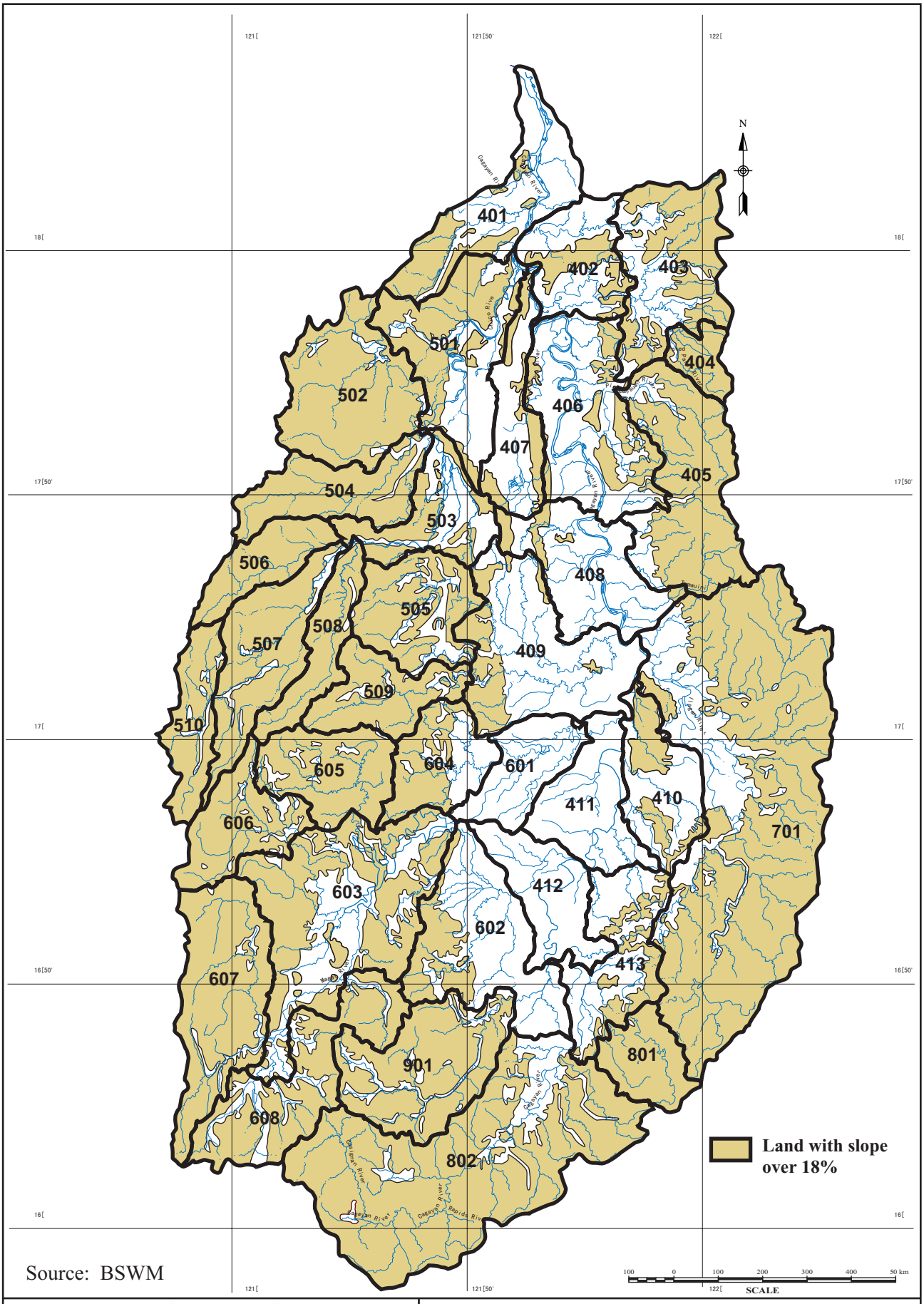
Figure 4.1.1

Existing Watershed Management Activities



The Feasibility Study of the Flood Control Project for the Lower Cagayan River in the Republic of the Philippines

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Figure 5.2.1

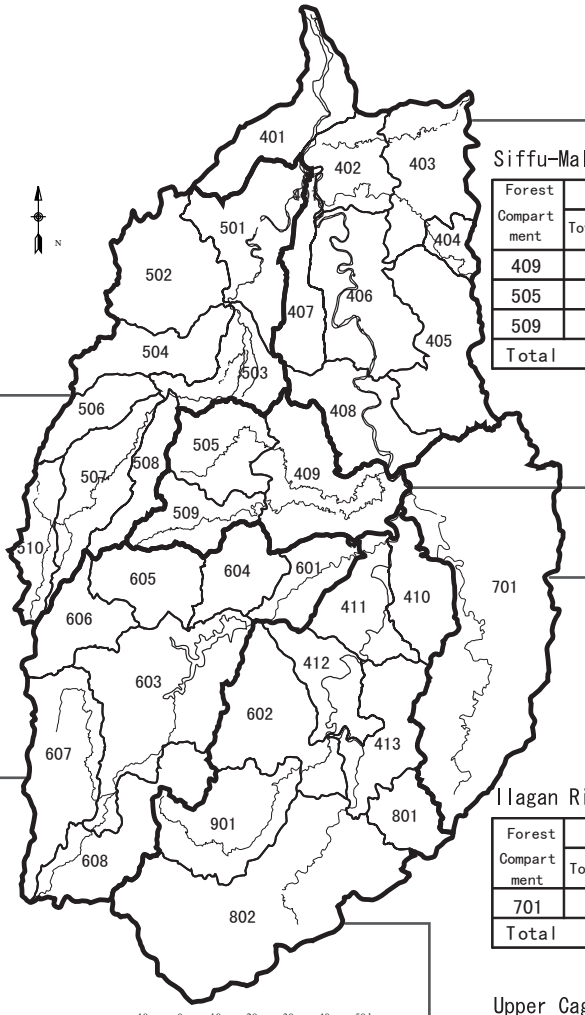
Land with Slope Over 18%

Chico River Basin

Forest Compartment	Land (km²)		Present Forest (km²)		Agricultural Land over 18% in Slope	Proposed Reforestation Area
	Total Area	Area over 18%	Total Area	Area over 18%		
501	884	504	437	274	27	203
502	917	881	881	854	0	28
503	509	270	231	163	27	80
504	580	551	540	528	0	23
506	372	372	342	338	0	33
507	676	608	522	507	2	99
508	368	357	353	353	0	4
510	379	345	232	231	0	114
Total						584

Lower Cagayan River Basin

Forest Compartment	Land (km²)		Present Forest (km²)		Agricultural Land over 18% in Slope	Proposed Reforestation Area
	Total Area	Area over 18%	Total Area	Area over 18%		
401	752	263	400	241	19	4
402	527	158	295	121	0	37
403	851	545	567	408	41	95
404	165	154	155	154	0	0
405	997	847	770	749	0	100
406	1,004	261	213	50	2	208
407	461	148	97	5	5	138
408	705	71	115	21	0	49
Total						632



Siffu-Mallig River Basin

Forest Compartment	Land (km²)		Present Forest (km²)		Agricultural Land over 18% in Slope	Proposed Reforestation Area
	Total Area	Area over 18%	Total Area	Area over 18%		
409	1,027	236	191	21	6	210
505	574	402	424	327	0	75
509	450	405	371	346	5	53
Total						338

Ilagan River Basin

Forest Compartment	Land (km²)		Present Forest (km²)		Agricultural Land over 18% in Slope	Proposed Reforestation Area
	Total Area	Area over 18%	Total Area	Area over 18%		
701	3,249	2,501	2,596	2,371	112	18
Total						18

Magat River Basin

Forest Compartment	Land (km²)		Present Forest (km²)		Agricultural Land over 18% in Slope	Proposed Reforestation Area
	Total Area	Area over 18%	Total Area	Area over 18%		
601	418	4	85	0	0	4
603	1,487	997	600	444	23	523
604	455	268	122	77	0	191
605	537	494	370	356	0	138
606	499	439	454	429	0	10
607	899	845	691	683	15	147
608	857	668	575	454	7	207
Total						1,226

Upper Cagayan River Basin

Forest Compartment	Land (km²)		Present Forest (km²)		Agricultural Land over 18% in Slope	Proposed Reforestation Area
	Total Area	Area over 18%	Total Area	Area over 18%		
410	526	184	197	32	4	148
411	550	0	154	0	0	0
412	511	0	137	0	0	0
413	638	191	444	166	0	26
602	963	250	484	164	51	36
801	327	324	325	324	0	0
802	2,310	2,033	2,174	1,901	1	130
901	860	731	796	678	0	52
Total						392

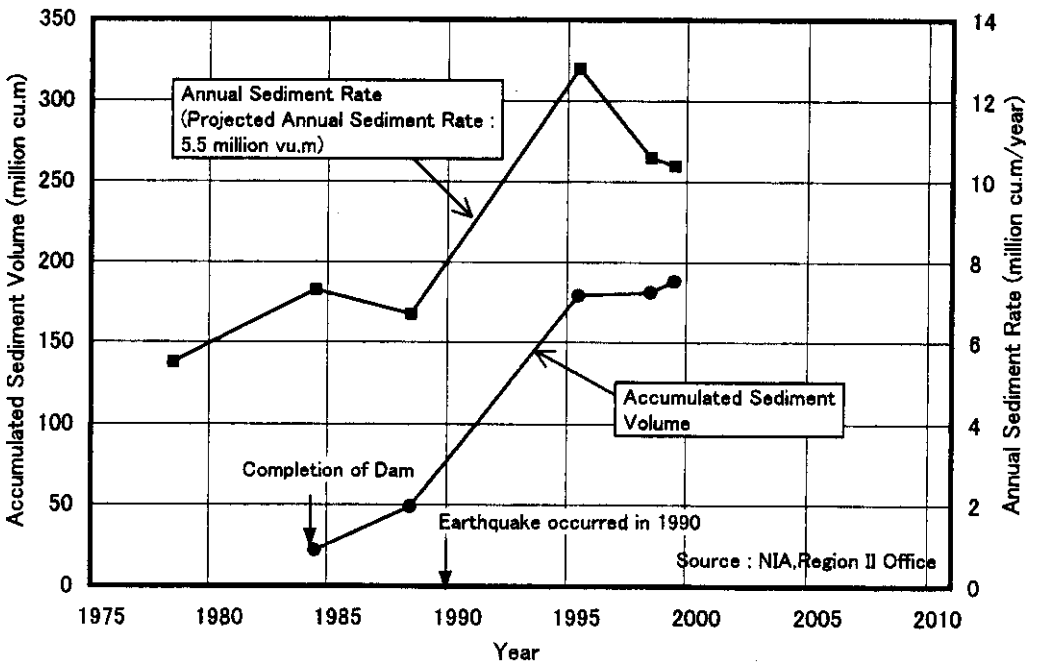
The Feasibility Study of the Flood Control Project for the Lower Cagayan River in the Republic of the Philippines

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 5.2.2
Proposed Reforestation Area

YEAR OF SURVEY	ACCUMULATED VOL.OF SEDIMENT (MCM)	AVE.ANNUAL SEDIMENT RATE (MCM PER YEAR)	SURVEYED BY
1978	INITIAL SURVEY	5.5 (1.3mm/yr) (Design value)	CONDUCTED BY NIA MRMP SURVEY TEAM (FINAL DESIGN PERIOD)
1984	22.0	7.3 (1982-1984) (1.8mm/yr)	NIA HYDRAULIC RESEARCH OF ENGLAND (HR)
1988-1989	49.0	6.7 (1982-1989) (1.6mm/yr)	NIA - IWMG CENTRAL OFFICE
1995	179.0	12.8 (1982-1995) (3.1mm/yr)	NIA - NPC JOINT STUDY TEAM
1998	181.0	10.6 (1982-1998) (2.6mm/yr)	NIA - DRD SURVEY TEAM
1999	188.0	10.4 (1982-1999) (2.5mm/yr)	NIA - DRD SURVEY TEAM

Source : 1999 Survey Results - Magat Reservoir and Tributary Rivers Sediment Range System, Dan and Reservoir Division, Magat River Integrated Irrigation System, December 2000.

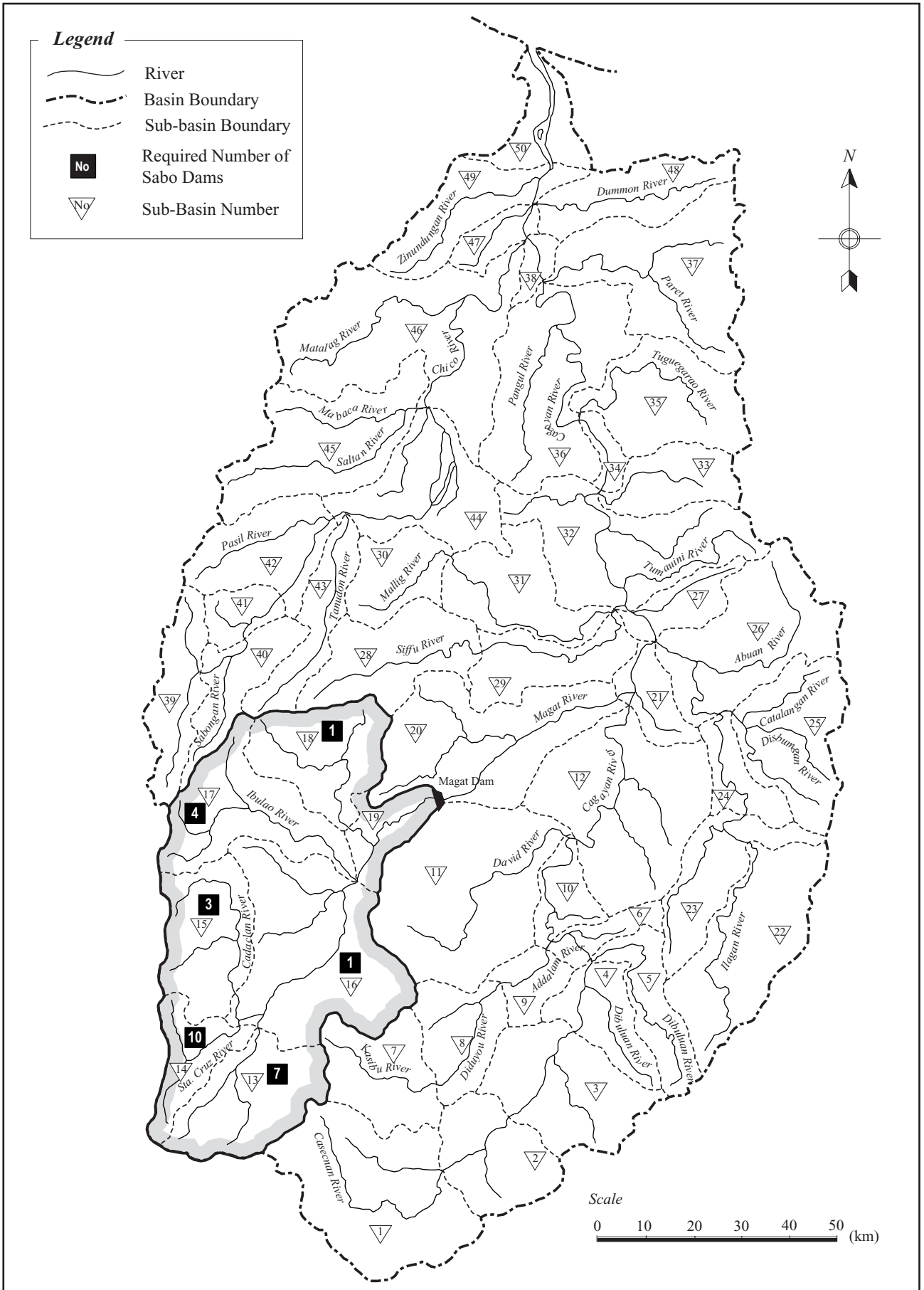


The Feasibility Study of the Flood Control Project for the Lower Cagayan River in the Republic of the Philippines

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 5.3.1

Sediment Record of Magat Reservoir



The Feasibility Study of the Flood Control Project for the Lower Cagayan River in the Republic of the Philippines

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Figure 5.3.2

Required Number of Sabo Dams