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Realities of the Watershed Management Approach: The Magat Watershed Experience

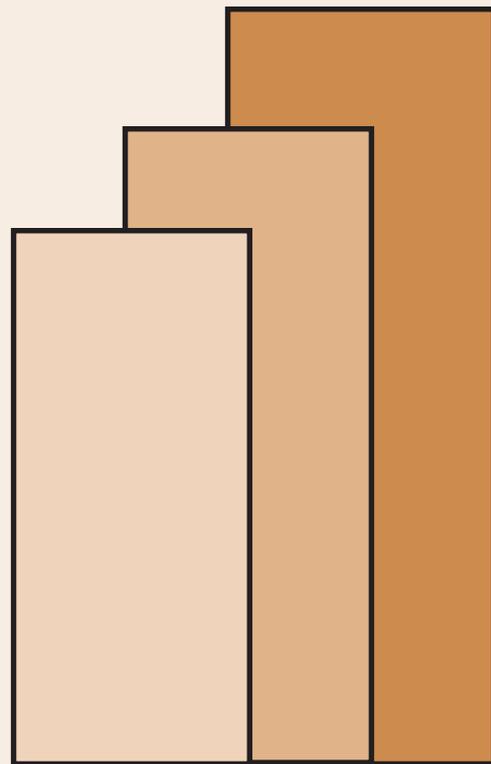
Dulce D. Elazegui and Edwin A. Combalicer

DISCUSSION PAPER SERIES NO. 2004-21

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July 2004

For comments, suggestions or further inquiries please contact:

The Research Information Staff, Philippine Institute for Development Studies
3rd Floor, NEDA sa Makati Building, 106 Amorsolo Street, Legaspi Village, Makati City, Philippines
Tel Nos: 8924059 and 8935705; Fax No: 8939589; E-mail: publications@pidsnet.pids.gov.ph
Or visit our website at <http://www.pids.gov.ph>

Abstract

This paper aims to showcase the experience of the Magat watershed in the implementation of the watershed management approach. Magat watershed was declared as a forest-reservation area through Proclamation No. 573 on June 26, 1969 because of its great importance to human survival and environmental balance in the region.

The Magat case demonstrates the important role that ‘champions’ like the local government unit (LGU) could play in managing the country’s watersheds. With the Nueva Viscaya province constituting 97% of the Magat watershed, the provincial government was committed to provide a strong management support system to the watershed. This involved interplay of critical elements, i.e., favorable policy and political environment, enabling social and institutional mechanisms, adequate financial support, and capable and committed actors and players.

The management approach adopted in Nueva Vizcaya treated the watershed as a ‘lifeshed’ where human concerns are connected with land and water resources. It was premised on ‘managing people first’ to relate society’s interests to the use of watershed resources. The provincial government was able to harness various stakeholders’ participation and tap technical and financial support. It provided incentives for people to join in participatory management schemes and to adopt conservation practices. The ‘feeling of control and sense of ownership’ served as ‘lifelines’ for individuals and organizations to sustain the watershed.

Keywords: Magat watershed, watershed management approach, watershed governance, participatory approach

Realities of the Watershed Management Approach: The Magat Watershed Experience (Draft Report)

Dulce D. Elazegui and Edwin A. Combalicer

INTRODUCTION

This paper aims to showcase the experience of the Magat watershed in the implementation of an integrated watershed management approach. Magat watershed was declared as a forest-reservation area through Proclamation No. 573 on June 26, 1969 because of its great importance to human survival and environmental balance in the region. It supports the Magat multi-purpose dam and appurtenant infrastructures for irrigation, hydroelectric power generation, domestic water supply, flood control, aquaculture, and other utilities.

The case study illustrates that sustainability of watershed requires a management support system. This involves interplay of critical elements such as favorable policy and political environment, enabling social and institutional mechanisms, adequate financial support, and capable and committed actors and players.

DESCRIPTION OF MAGAT WATERSHED

Location and Scope

The Magat watershed is located in the northern part of the Philippines covering major portions of Nueva Vizcaya and part of Quirino and Isabela provinces of Region 2 (Figure 1). It has a total area of 234,824 hectares almost 98% of which covers all the 15 municipalities Nueva Vizcaya (Table 1). Around 2% of the watershed area covers one municipality (Diffun) in the southern part of Quirino and two municipalities (Cordon and Ramon) in southern Isabela.

Within the Magat watershed is one reservoir impounded by the Magat dam located along the boundary of Ifugao and Isabela provinces. It is six kilometers upstream of the old MARIS Diversion Dam in Oscariz, Ramon, Isabela, 350 kilometers north of Metro Manila. The dam with a storage capacity of 1.08 billion m³ provides for irrigation to 95,000 ha of land and hydroelectric power generation (360 megawatts).

The Magat river is the main tributary for the Magat multi-purpose dam and is connected to the Cagayan river. Cagayan river basin is a large-scale watershed with an area of about 2,728,100 ha. The other tributaries to Magat watershed are Santa Cruz, Santa Fe, and Marang rivers in the Nueva Vizcaya side.

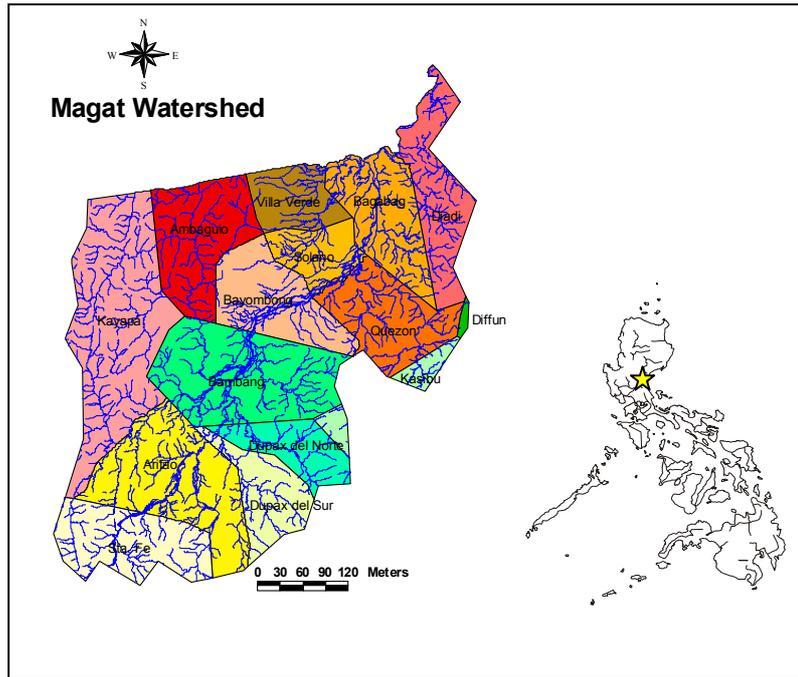


Figure 1. Location of the Magat watershed

Table 1. Provinces and area covered by Magat watershed.

Province	Total Area (ha)	Area covered by the watershed (ha)	Proportion (%)
Nueva Vizcaya	390,390	229,001	97.52
Quirino	305,718	467	0.20
Isabela (Magat reservoir)	1,066,456	5,356	2.28
Total	1,762,546	234,824	13.32

Magat watershed has four areas managed by different institutions (Table 2). The Lower Magat Forest Reserve is co-managed by the local government units (LGUs) of Nueva Vizcaya and the DENR. The Imungan-Cabanglasan Subwatershed, occupying five municipalities of Nueva Vizcaya, is under DENR. Dupax Watershed has been declared a forest reserve while Barobbob Watershed has been devolved to the local government.

Table 2. Classified area within the Magat Watershed.

Classified Area	Location	Area (ha)	Jurisdiction
Lower Magat Forest Reserve	Diadi and Bagabag, Nueva Vizcaya (NV)	24,251	Subdivided into seven sub-watersheds and co-managed by LGU-NV and DENR
Barobbob Watershed	Bayombong (NV)	439	Managed by LGU
Imungan-Cabanglasan Sub-watershed	Kayapa, Sta. Fe, Dupax del Sur, Dupax del Norte, and Bambang	60,431	Under the jurisdiction of the DENR
Dupax Watershed Forest Reserve	Dupax del Norte and Dupax del Sur	424.8	Proclaimed as forest reserve

Biophysical Characteristics

Topography and Soils. The slope of Magat watershed ranges from flat to very steep. The floodplain of the watershed is the area where most rice farming takes place. The rolling and not so elevated areas are planted to upland crops, fruit trees and vegetables. Areas that are steep and/or highly elevated are mostly dipterocarp forests and some pine forests.

Soil is generally characterized in various forms of clay loam and sandy loam soils. Soil types of a large portion of Nueva Vizcaya are Guimbalaon clay loam and Annam clay loam.

Rock formation is mostly igneous rock and few scattered sedimentary rocks. There are four major sets of fault lines in the watershed. The earthquake that occurred in 1990, with intensity 7 resulted in landslides and siltation of the Magat river and its tributaries.

Climate. The prevailing climate categories are Type II and Type III. Type II climate has two pronounced seasons; dry from November to April and wet the rest of the year. Type III climate does not have very pronounced seasons but there is a relatively dry weather condition from November to April and relatively higher rainfall in other months. The southwestern part of the watershed falls under Type II.

Land Classification. Almost 70% (144,381 ha) of the watershed is classified as forestland (Figure 2). The remaining area (85,089 ha) is alienable and disposable lands devoted to agriculture and grassland. There is not much forest in this area although there are private plantation forests in flat areas.

Based on 1998 Classified Landsat TM imageries, majority of the land cover are grasslands. The rest are dipterocarps, brushes, mossy forests, and agricultural areas (Fig. 3 and Table 3). There were no drastic changes in land use between 1988 and 1998.

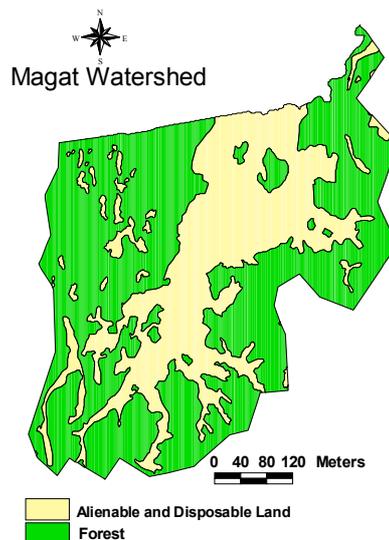


Figure 2. Land classification in the Magat watershed.

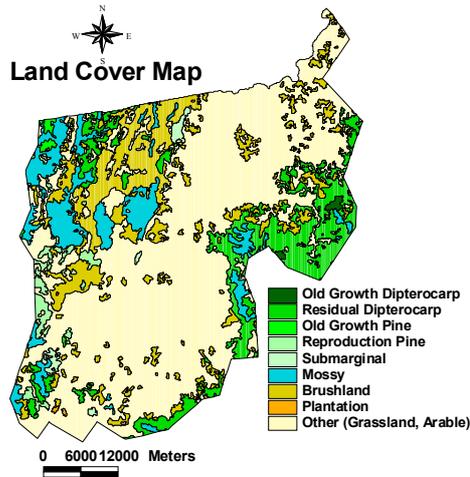


Figure 3. Spatial distribution of land cover in the Magat watershed.

Table 3. Distribution of land use/land cover in the Magat watershed, 1988-1998.

Land use (Total area: 234,824ha)	Percent of total watershed area (%)		
	1988	1990	1998
Built-up	.15	0.19	0.40
Agriculture	10.22	6.01	7.00
Dipterocarp	14.98	13.11	16.20
Brush	15.77	4.83	10.60
Mossy	5.99	6.24	7.20
Grassland	52.33	66.93	55.60
Bareland	0.32	2.28	2.50
River	0.35	0.44	0.60

Source: Bato (2000)

Flora and Fauna. There are approximately 79 families and 298 plant species and 300 unidentified species in the Cagayan Valley. Some endangered tree species grow in Nueva Vizcaya and this includes Kalantas (*Toona kalantas*). Dominant species of natural forest in Quirino are, Dao (*Dracontamelon dao*), Dungon (*Heretierra silvatica*), Mayapis (*Shorea palosapis*), and White lauan (*Shorea contorta*).

Biological diversity and endemism of wildlife in the Philippines is considered high. Most mammalian species are situated in lowland forest, montane forest, or mossy forest. Bat species are distributed widely in lowlands and disappearing as elevation increases. Other small animals show a steady increase in diversity with increasing elevation.

River Structures. The reservoir within the watershed is impounded by the Magat dam and two diversion weirs, the Pelaway and the Taan weirs. Bank protection works are occasionally observed in the main Magat reservoir and in their tributaries to protect adjacent residential areas, trunk roads and bridges, and agricultural land. There are some spur dikes with revetments in the upper Magat river.

Sedimentation. The sedimentation in the reservoir of the Magat dam is considered serious due to increased sediment discharge from the upper basin. Sediment volume accumulated from 7.4 million cu. meters to 213 million from 1982 to 2000 as a result of the earthquake in 1990. Rate of sedimentation declined dramatically from 21.7 in 1995 to 6.7 in 2000 (Table 4).

Table 4. Sedimentation in the Magat Reservoir, 1982-2000.

Year	Accumulated Sediment Volume (million m ³)	Annual Sediment Rate	Remarks
1982	7.4	-	Completion of dam
1984	22.0	7.3	
1989	49.0	5.4	Earthquake in 1990
1995	179.0	21.7	
2000	213.8	6.7	

Source: NPC

Soil Erosion. Large portion of the watershed has slight (41%) to moderate (2.4%) erosion. Severe erosion (27.4%) is observed in the southern and mountainous portions. There is no apparent erosion in the low-lying areas of the watershed (Figure 4).

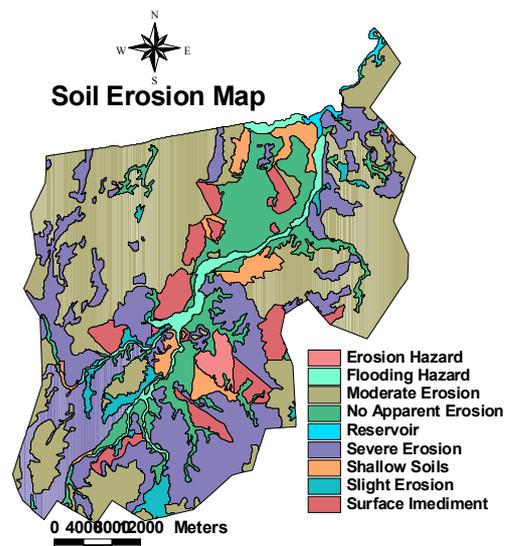


Figure 4. Spatial erosion condition in the Magat watershed.

Socio-economic Conditions

Population. The watershed population as of May 2001 records of the Regional Office of the National Statistics Office was 483,411 (Table 5). Nueva Vizcaya accounts for about 76% of the watershed's population. Average household size is 4.92 persons. Estimated average population density among municipalities within the watershed is 205 persons/km². The population growth rates of Nueva Vizcaya and Isabela are lower than the national average of over 2%.

Table 5. Total population and households within the Magat watershed, 2001.

Province/Municipalities	Total Population	Number of Households	Growth rate (1990-2000)
Nueva Vizcaya (All municipalities)	366,962	74,402	1.99
Quirino (Diffun)	39,489	8,274	2.67
Isabela (Cordon and Ramon)	76,960	15,743	1.77
Total	483,411	98,419	

Source: National Statistics Office (As of May 2001)

Ethnicity. There are 28 ethnic groups in the area, mostly the Ilocano and Ifugao. The highest number of ethnic groups lives in Villa Coloma, Bagabag (DENR-JICA 2001). Other ethnic groups in Nueva Vizcaya are the Bugkalots or Ilongots and Kalanguyas (Agbayani and Tiongson 2003).

Interactions with External Societies. Some communities enjoy intensive support, resources, information or influence from NGOs and donors. Due to limited facilities such as roads, transportation means, market outlets and information, others communities are quasi self-reliant.

Revenue Generation. The watershed's sources of revenues are agriculture, livestock, and service sectors. The overall economic revenues from April 2000 to April 2001 amounted to over PhP1.9 million. The service sector accounted for 45.73% of total revenues, followed by agriculture sector (43.12%) and livestock sector (11.15%). The average yearly revenue per household was PhP41,325 or PhP3,443 per month. Upland communities within the watershed accord equal importance to agriculture and service sectors. The smaller the revenues Peoples' Organizations (POs) derived from agriculture, the greater was the interest shown on economic income to be derived from participating in community-based forest management (CBFM) program.

The Magat watershed resources offer various economic purposes and services for revenue generation such as the ff:

- 1) Timber (From Natural and Plantation Forest) – furniture, wood carving, house and building construction materials;
- 2) Rattan – furniture for local purpose;
- 3) Quarry (Gravel and sand, mines) – road and building construction, and exploration of gold, and copper;
- 4) Wildlife – aesthetic/commercial;
- 5) Agroforestry land – upland farming, CBFM Program;
- 6) Rangeland for grazing – cattle production; and
- 7) Reservoir surface area – water for irrigation, fish production, domestic uses, and electricity generation

Major resource users in the watershed include the National Power Corporation (NPC), National Irrigation Administration (NIA), fisherfolk, upland farmers, peoples' organizations, barangay residents within the watershed, non-government organizations, water operators, and mining companies. NPC provides electricity in the area while NIA services

about 192,000 ha of rice farms. There are about 500 fisherfolk with a total of 10 tons of fish catch per day. Upland farming mainly for home consumption is minimal. For recreation, tourists have free access to the watershed.

In the Magat watershed, agriculture revenues were generated mainly from three types of production: diet crop, vegetable, and fruit production. Diet crops include rice and corn. Lowland rice and corn are planted on the flat areas adjacent to the Magat river and its tributaries for better irrigation. In Nueva Vizcaya, paddy is the major crop grown with a total area of 44,847 ha or 46.5% of the total agricultural land which is 99% irrigated and 1% rainfed. Corn lands occupied 11.3% of the total cropping area. However, revenues from corn sales (86.30%) are higher than rice.

Revenues from vegetable sales are higher than diet crops revenues. There are 28 vegetables grown in the area but sweet peas and Baguio beans comprised half of all economic revenues. Nueva Vizcaya has established itself as the major producer of both tropical and temperate vegetables in Region 2. Of the total agricultural land, 3-5 % has been devoted to vegetable growing.

Revenues from fruits were relatively smaller than those obtained from diet crops and vegetables. Two-thirds of such revenues were derived from banana. Around 25,600 ha, occupying 26.6% of the total agricultural land in Nueva Vizcaya, was devoted to fruit orchards, e.g., mango, citrus. Other fruits are papaya, mandarin, peanut and pineapple.

Livestock production, e.g., carabao, cattle and goat, within the watershed are at backyard and commercial scale. These grazing animals require large open spaces often in forestlands and therefore have impacts on forestlands.

Rattan, bamboo and almaciga resin are the major non-timber forest products in the Magat areas. Several cutting permits were granted to Integrate Social Forestry (ISF) farmers in Nueva Vizcaya alone yielding more than 220 m³ of Gmelina in 2000. Wood processing is dominated by a number of mini-sawmills and re-saw entities. Many unrecorded mini-sawmills or re-sawmills are likely producing the lumber requirements of the estimated 70 furniture makers in the area. Large sawmills ceased operation in the 1980s.

There are 12 different mining interests, mainly gold and copper in the watershed. They have Exploration Permit Applications (EPA), Mineral Production Sharing Agreements (MPSA) or FTAA. The mining sites are situated in Nueva Vizcaya and four also have sites in Quirino.

The watershed, particularly the northern portion, is a major aquaculture production center and is widely noted for its tilapia.

The Provincial Waterworks Office is responsible for the distribution of water to around 2,500 households and other establishments in Bayombong and Solano, Nueva Vizcaya charging certain water fees (Table 6). It is directly under the Office the Governor

with the Environment and Natural Resource Office (ENRO) assisting in the maintenance of the water source.

Table 6. New water rate scheme in Nueva Vizcaya, as of January 1, 2004.

Classification	Min (1-15 cu m) PhP	Excess	
		16-40 cu m (PhP)	41 cu m and up(PhP)
Household	40	3.00/cu m	4.00/cu m
Institution	40	3.00/cu m	4.00/cu m
Commercial	40	4.00/cu m	5.00/cu m

Source: Internal Document of the Nueva Vizcaya Provincial Waterworks.

WATERSHED MANAGEMENT REALITIES: AN INSTITUTIONAL ANALYSIS

The next sections provide an institutional analysis of watershed management strategies in the Magat watershed. The focus of discussions are: economic considerations or financial capital provided to the watershed; the technical and administrative capacity of parties involved or the intellectual capital; their capacity for social governance, i.e., social and institutional capital; and the legal framework within which the management approach operates, i.e., political capital.

Economic Considerations (Financial Capital)

There is no exclusive comprehensive watershed management plan for the Magat watershed. However, in 2003, the Department of Environment and Natural Resources (DENR) and the Japan International Cooperation Agency (JICA) prepared the Master Plan Study for Watershed Management in Upper Magat and Cagayan River Basin. Pilot studies were conducted covering an area of 880,000 ha including the Magat watershed to obtain information that would be useful to the implementation of the Master Plan. The government of Japan provided fund/aid (amount undisclosed) and the Philippine government provided technical personnel.

The Master Plan came up with different recommended watershed initiatives for the improvement of biological, physical, and socio-economic conditions of the entire area in consonance of improving water quality and quantity as well. The Plan considers water as a very important resource and product of the watershed. But since water management is within the authority of the National Water Resource Board (NWRB), the Plan suggests that there should be a system for water pricing and a mechanism to compensate LGUs for water sourced from the watersheds. The watershed management initiatives contained in the Master Plan address land use planning, forest management, rehabilitation and restoration, soil conservation, livelihood, capacity building of DENR and POs, and cost sharing mechanism in watershed management. However, aside from the CBFM strategy, the Plan has not yet been adopted in the area. Implementation cost is estimated at PhP573.3 million.

Watershed and Water Management Initiatives. Direct responsibility for management of the watershed rests with the government, primarily the DENR. In Magat, most projects are led by DENR through the Regional Environment and Natural Resources Offices (ENRO) of Region II, Provincial ENROs of Nueva Vizcaya, Isabela and Quirino, and Community ENROs of Nueva Vizcaya (Dupax del Norte, Bayombong, and Aritao), Isabela and Quirino.

Meanwhile, water as a product of forestlands and watersheds is not within the authority of DENR to control and regulate. Supervision and control of utilization and protection of water resources are exercised by the National Water Resources Board (NWRB) under the Office of the President. However, various water users, e.g., NPC, NIA, POs, have been involved in watershed protection projects in Magat. NIA and NPC have their own watershed management units to implement projects to sustain the watershed as a water source. Other projects are led by LGUs, either through the provincial or municipal government (Table 7).

Watershed management initiatives in Magat range from short-term to medium-term projects spanning from one (1) year to ten (10) years (Table 6). Projects are funded by the national government, e.g., DENR; by LGUs; and international organizations, e.g., Asian Development Bank, International Tropical Timber Organization (ITTO). DENR, for instance, had a yearly allocation of PhP2.6 million for natural forest protection and about PhP1.6 million for soil and water conservation measures from 1994-2003. NIA and NPC also have their own appropriations. NIA has a budget of PhP3 million for a one-year project on reforestation, maintenance and protection of forest, nursery establishment, etc. NPC spent over PhP2 million in 2000 for regular patrolling and PhP2.7 million for information dissemination.

Watershed projects, although spearheaded by an agency, are generally implemented in collaboration with other stakeholders, e.g., DENR with funding agencies, LGUs, and POs. Popular examples are the Integrated Social Forestry (ISF) Program and Community-Based Forest Management (CBFM) Program. Pursuant to DAO 92-30 and as provided for in the Local Government Code, all Integrated Social Forestry (ISF) Projects except one model site in each province, including ISF personnel, were turned over to the Provincial government, instead of the Municipal government.

The provincial office of the National Commission on Indigenous People (NCIP), since 1997, has focused its activities on the identification of ancestral land domain, and organization of indigenous cultural communities (ICCs) and indigenous peoples (IPs) in the uplands. NCIP has also mediated in resolving conflict in the Magat watershed.

Table 7. Watershed management initiatives and budget allocation in the Magat watershed, 1994-2004.

Lead Agency	Watershed Management Initiatives	Budget Allocation	
		Year	Allocation (PhP)
DENR-PENRO –Nueva Vizcaya	Integrated Social Forestry Program	1994-1996	1,697,025
	Community Forestry Program	1995-1996	30,000*
	Forest Land Management Program	1994	758,000*
	Tree Farm/Plantation Development	1994-2003	8,072,000
	Establishment of Soil & Water Conservation Measures	1994-2003	16,545,000
	Protection of Natural Forest	1994-2003	26,226,000
	Protected Areas Management/Biodiversity Conservation	1996-2003	7,042,000
	Community Based Forest Management Program	1998-2003	5,760,000
DENR-CENRO Bayombong	Construction of Check dams and Small Impounding Structure	2003	230,000
	Construction of Check dams and Small Impounding Structure	2002	132,000
DENR-CENRO Aritao	Structural/Engineering Measures	2000-2004	
	Establishment of Vegetative Measures	2000-2004	
DENR-CENRO Dupax del Sur	Small Water Impounding Dams	1995-2000	
	Plantation Establishment	1994-2001	
LGU-ENRO	Allocation of Open Access Areas within CMFR	2000-2003	2,217,585
	Protection and Management of Barrobbob Watershed	1999-2003	1,950,000
	Tree for Legacy Program	2001-2003	2,153,268
	Cabuaan Watershed Project	2000-2003	550,000
	Social Forestry Development and Watershed Rehabilitation Project	2003	100,000
	Bangan Hill Reforestation Project	2000	151,000
	Social Forestry Productivity Enhancement Program	2000-2003	1,170,400
	Ecological Restoration of Environment Through Participatory Approach to Reforestation	2000	680,000
	Mass Production of Indigenous spp Using Vegetation Clonal Propagation	2000-2002	340,000
	Bamboo Propagation for Reservist	2002-2003	200,000
	Bamboo Propagation and River Bank Stabilization	2002-2003	300,000
	Rat-Rattan sa Kagubatan ng Nueva Vizcaya	2002-2003	225,000
	Upper Magat Reserve Project (CADC/Kalahan)	2002	100,000
	Ancestral Domain Nursery Seedling Production Project	2000-2001	70,000.00
	Bayagong Community Forest Steward Development Project	2000-2001	165,250
	NPC (Watershed Unit)	50-hectare Reforestation Project	2003
Established Nursery		2002	1,759,118
Partial Timber Inventory		2001	
Regular Patrolling		2000	2,775,111
Maintenance & Protection of Plantation		1999	1,111,850
Information Dissemination		1998	2,774,400
NIA	Reforested 1,000 hectare of mixed spp	2003	3,000,000/yr
	Fertilization of the Planted spp	2002	3,000,000/yr
	Community Information Dissemination Regarding Forest Protection	2001	3,000,000/yr
	Head File Legal Actions Against Forest Violators	2000	3,000,000/yr
	Established Nursery	1999	3,000,000/yr
	Maintenance & Protection of Plantation	1998	3,000,000/yr
	Timber Inventory/TSI	1995	3,000,000/yr

*Cost of activities under these programs undertaken thru contract not included

Source: Imugan-Cabanglasan Watershed Rehabilitation Project, Work and Financial Plan, CENRO Aritao LGU-ENRO, CENRO Bayombong, CENRO Dupax del Sur, PENRO – Nueva Vizcaya, NIA, NPC

The provinces within the Magat watershed have their own budget allocations for forest protection (Table 8). Nueva Vizcaya appears to have the most commitment to forest protection having a budget allocation of PhP728 per ha. It also created a provincial Environment and Natural Resource Office (ENRO).

Table 8. Budget of provinces for forest protection purposes within the watershed, 2001.

Concerned LGUs	Total MOE for Forest Protection	Budget (MOE) allocation per hectare (PhP/ha)
Nueva Vizcaya	425,000	1.26
Quirino	481,000	1.90
Isabela	790,000	Na
Nueva Vizcaya – ENRO	320,000	728.90

Source: Excerpt from DENR-JICA Interim Report (2001)

Scope of Projects. Areas and activities covered by projects vary on a region, province, municipality, sub-watershed, or even on need-basis such as the ff.:

1. The DENR Project on Reforestation by Administration (REFO-A) using waged labor targets critical watersheds where rehabilitation of forest vegetation is considered urgent. There are eight existing REFO-A projects in the Nueva Vizcaya portion of the watershed and two projects have been converted into CBFM projects. There are no new plantations at present due to budgetary constraints.

2. The Reforestation by Contract (REFO-C) Project under the OECF-ADB Loan had 12 projects in Nueva Vizcaya and 19 in Quirino which were later incorporated in the CBFM program. Thus, all existing CBFM projects include former REFO-C project areas.

3. The Watershed Rehabilitation Project (WRP) included in DENR's annual appropriations has two WRP projects in Isabela, two in Quirino and five in Nueva Vizcaya. Activities are limited to small-scale constructions and vegetative cover works.

4. The International Tropical Timber Organization (ITTO) project with DENR from 1998-2002, also known as "Developing Tropical Forest Resources through Community Based Forest Management" is site-specific. It covers 3,000 ha of forestlands in Buenavista, Bayombong, Nueva Vizcaya within the watershed of the Matuno River, a major tributary of the Magat River. It has been managed by the federation of POs with CBFMA concerned.

The Project has established 200 hectares of forest plantations using techniques developed during the first phase (Plantation Establishment Research), protected the entire CBFM area from illegal logging and other destructive agents, monitored growth and yield of plantations, and implemented effective fire protection which has accelerated natural regeneration.

5. NIA started tree plantation and agroforestry projects on 7,500 ha of the watershed which was later reduced to 4,196 ha due to fire incidence. In 1997, NIA transferred about 1,017 ha within Ifugao province to NPC covering the towns of Alfonso Lista, Aquinaldo and Mayoyao. Current activities include replanting of burned areas, maintenance of mango plantation, and distributing seedlings, fertilizers and pesticides, and providing technical assistance to 100 ha- pilot community forestry.

6. The Provincial Waterworks Office of Nueva Vizcaya also conducts watershed activities such as reforestation, preservation, and periodic cleaning of the Barobbob watershed and water spring. It also provides support to the watershed activities of the ENRO.

7. The reforestation program on "Grow a Family Tree for Legacy in DENR Region 2" also known as Tree Resources for Education, Enterprise and Legacy Program or Tree for Legacy Program, was open to individuals, groups and organizations. It is a multi-sectoral program led by DENR and the Provincial Government of Nueva Vizcaya covering more than 2,000 ha.

8. The Barobbob Watershed Resource Management Project is sub-watershed-specific project in Masoc, Nueva Vizcaya with an area of 439 ha. Barrobob watershed, a protected area, provides potable water to about 2,000 households in the municipalities of Bayombong and Solano, and irrigation water to about 400 ha of rice fields.

9. The Lower Magat Forest Management Project is also a co-management project of the DENR and the Provincial Government of Nueva Vizcaya. It covers an area of 24,251 ha forestland and 6,547 ha A&D land in the municipalities of Diadi and Bagabag. There are 1,100 project sites as of August, 2001 in Nueva Vizcaya. The Lower Magat Forest Management Office (LMFMO) is promoting applications for tenurial agreement such as Agro-forestry Land Management Agreement, Community-Based Agro-forestry Land Management Agreement through appropriate land use.

10. The Center for People Empowerment in the Upland (CPEU) showcases sustainable agroforestry technology in its five model sites covering 1,132 ha within the Magat watershed and neighboring areas. There were reports that the CPEU sites in Isabela and Quirino were integrated into Community-based Forestry Management (CBFM) projects and are now serving as provincial model sites of CBFM. CPEU also serves as training centers for DENR staff, people's organizations (POs), non-government organizations (NGOs) and other entities.

11. The Comprehensive Agrarian Reform Program (CARP) led by the Department of Agrarian Reform (DAR) had allotted 20,000 ha to settlers in Conwap Valley, covering part of Nueva Vizcaya and Quirino despite the DENR's reallocation of only 6,000 ha of the forestlands for A&D. Most of the settlers within this area were relocated from the construction of Ambuklao Dam and Binga Dam in Benguet. Part of the Conwap Valley was proposed for a Civil Reservation as a resource of timber for the settlers.

Technical/Administrative Capacity (Intellectual Capital)

The presence of the Nueva Vizcaya State Institute of Technology (NVSIT), formerly the Nueva Vizcaya Agricultural College, and the Isabela State University is very strategic for the enhancement of the watershed management discipline in the watershed area. In NVSIT, watershed management was introduced as a major course in the BS forestry curriculum (Appendix A) in 1977, MS Forestry in 1997, MS Agricultural Engineering in 2001, and BS

Environmental Science in 2001. NVSIT ranked second among 15 universities in the Philippine in the Forestry Olympiad held in February 2004. This is a competition on knowledge and skills on forestry subject.

Number of Personnel in Watershed Management. Nueva Vizcaya probably has the highest ratio of foresters in the country (Agbayani and Tiongson 2003). Agencies involved in Magat watershed management generally have personnel on a full-time work basis. CENRO has one to five staff, PENRO in Nueva Vizcaya has one (Table 9). ENRO under the provincial government of Nueva Vizcaya have four personnel while NIA and NPC have six and eight, respectively in their watershed management units.

Table 9. Number of people involved in watershed management per agency/entity and proportion of time involved.

Agency	People Involved	Proportion of time involved
CENRO Dupax del Norte, Nueva Vizcaya	4	1 fulltime and 3 on-call basis
CENRO Aritao, Nueva Vizcaya	5	Fulltime
CENRO Bayombong, Nueva Vizcaya	1*	Fulltime
PENRO Nueva Vizcaya	1*	Fulltime
ENRO Nueva Vizcaya	4	Fulltime
NIA	6	Fulltime
NPC	8	Fulltime

*Note: Assigned in watershed unit but all personnel in forest management division are working in the watershed.

Educational Background of Personnel. Almost all of the personnel have technical background with degrees in BS Forestry from NVSIT or ISU (Table 10). Others have degrees in agriculture or engineering. Some are holding administrative positions, e.g., Project-in-charge, CENRO, Chief of either planning or watershed unit of their agencies. Some personnel, i.e., of NIA and NPC, render support services to watershed management activities. The ENRO of the provincial government of Nueva Vizcaya has four forester items with forestry and agriculture-related degrees for educational qualifications.

The personnel also had additional training related to watershed management and development (Table 11). This includes watershed characterization, erosion control, Geographic Information Systems (GIS), soil and water conservation, environmental impact assessment (EIA), and community organizing.

Table 10. Technical and administrative background of personnel involved in watershed management.

Agency	Background		Degree	Year Obtained	School Attended
	Technical	Administrative			
CENRO Dupax del Norte, Nueva Vizcaya	1 Forester 3 Forest Ranger	Project In-charge	BS Forestry	1980	NVSIT
PENRO (Nueva Vizcaya)	Forester		BSF	1974	NVSIT
CENRO Aritao, Nueva Vizcaya	CENRO		BSF	1975	GAUF
	Forestry Specialist		BSF	1974	UPLB
	Chief, Watershed Section		BSF	1973	GAUF
	Chief, Planning		BSF	1981	NVSIT
	Engineer		BS Civil Engineering		
CENRO Bayombong	Chief, Watershed Unit		BSF		NVSIT
LGU-ENRO	4 Foresters		BSF		NVSIT/ISU
NIA			BSAEng		
			BSF	1982	ISU
			BSA		
			BSA		
		Support Services	HS Grad		
			BSF	1979	ISU
NPC (Watershed Unit)		Chief	BSF		GAUF
	Forester		BSF		BSU
	Forester		BSF	1995	UPLB
	Tech. Assistance				
		Support Services			
		Support Services			
	Tech. Assistance				
		Support Services			

Table 11. Training on watershed management undergone by personnel.

Agency	Training on Watershed Management
CENRO Dupax del Norte, Nueva Vizcaya	Watershed characterization and profiling Training on integrated watershed management Bamboosetum and clonal propagation Seminar on land use plan Inventory of forest occupants EIA system training
PENRO (Nueva Vizcaya)	Protected Areas Management
CENRO Aritao, Nueva Vizcaya	Regional Training Course on Erosion Control Management Watershed System Development Training Geographic Information Systems Remote Sensing Training Course
LGU-ENRO	Geographic Information Systems Soil and Water Conservation Farm Planning Agroforestry
NPC	Tree propagation Community Organizing
NIA	Watershed Management and Development

Social Governance Capacity (Social/Institutions Capital)

Governing structure and sharing of responsibilities. Magat watershed is mainly under the jurisdiction of the DENR, and to a certain extent GOCCs like the National Irrigation Administration and National Power Corporation, the provincial government and municipal government units. DENR provides resources and services to the provincial government to ensure effective protection, development, and management of the area. The DENR-PENROs plan, coordinate and control various activities in the province and guide, supervise, and provide logistics to CENRO operations.

NIA and NPC have the authority to manage, develop, and rehabilitate portions of Magat Dam devolved to them. In 1997, NIA and NPC jointly created the Magat Watershed Area Team to implement programs and development projects that include reforestation, patrolling, enforcement of forestry laws, livelihood training, and other community services.

The LGUs encourage and promote participation of the private sector and entrepreneurs. They also lead and provide assistance to communities, e.g., capability building and empowerment of people's organizations, linkage with institutions, and access to social services, technologies and funds for forest land development and generation of alternative livelihood opportunities.

LGUs assistance to CBFM projects includes provision of financial and technical assistance, as well as infrastructure such as farm-to-market roads, water system and irrigation development. LGUs endorse applications to CBFM Agreement between the proponent PO and DENR.

Community Participation. There are 18 POs, e.g., upland farmers' federation, involved in the Magat watershed management activities with membership ranging from 25 to 207. Twelve (12) POs are in Nueva Vizcaya, five in Quirino and one is in Isabela. Activities of these POs are mainly CBFM projects, trainings on accounting, entrepreneurship, leadership, IPM, and reforestation (Table 12).

Table 12. Peoples' Organizations (POs) and activities within the Magat watershed.

Name of PO	No. of Members	Nature of Activities
<i>Nueva Vizcaya</i>		
Gadagad Vegetable and Fruit Tree Growers Association	42	Community-Based Forest Management Program
Bakir Pagbiagan ti Pagilian CBFM Association	42	Community-Based Forest Management Program
Latar Ilocano Minority Farmers Association Inc.	68	Community-Based Forest Management Program
Buyyasyas Iwak Tribal Council	86	Community-Based Forest Management Program
Yaway Farmers Multi-Purpose Cooperative Inc.	120	Community-Based Forest Management Program
Association of Upland Farmers of Sinian Nueva Vizcaya Inc.	207	Community-Based Forest Management Program
Singian Agro-Forest Association	28	Community-Based Forest Management Program
Socio-Economic and Environmental Development Cooperative Inc.	52	Community-Based Forest Management Program
Federation of Vista Hills, Kalongkong and Kakilingan Upland Farmers	25	Community-Based Forest Management Program
Mabasa Tree Planters and Growers Association, Inc.	61	Community-Based Forest Management Program
Banila Community-Based Association	100	Reforestation project funded by DENR Tiger grass plantation funded by NEDA Sales (cooperative store) Trainings conducted (basic accounting, entrepreneurship seminar, integrated pest management, and leadership)
Bitnog Guijo Greeners Association	58	Community-Based Forest Management Program
<i>Quirino</i>		
Rafael Palma Multi-Purpose Cooperative Inc.	100	Community-Based Forest Management Program
Ifugao Village Aphochan Multi-Purpose Cooperative	156	Community-Based Forest Management Program
Baguio Village Intercultural Association	32	Community-Based Forest Management Program
Don Mariano Perez Farmers Multi-Purpose Cooperative	35	Community-Based Forest Management Program
Salinong T. Campamento Association	59	Community-Based Forest Management Program
<i>Isabela</i>		
Taleb Upland Farmers Multi-Purpose Coop. Inc.	37	Community-Based Forest Management Program

Source: DENR internal document
LGU-ENRO documents

Sharing of power and responsibilities. Most watershed management projects adopt a collaborative approach and some even gained nationwide recognition as watershed management models. Examples of these projects and strategies adopted are the ff.:

1. Barobbob Watershed Resource Management – The Barobbob watershed project in Nueva Vizcaya received the *Galing Pook* award of excellence in 1999, being one of the ten outstanding CBFM programs in the country (Agbayana and Tiongson 2003).

The 439-ha watershed was declared a protected area but squatting of families and settlers, degrading agricultural practices, illegal logging remained unabated. Thus, the provincial government petitioned for the watershed to be devolved to the province and this was granted in 1992. Ejecting the people or relocating them to other areas did not work as it met some resistance. The provincial government, thus conducted consultation, consensus building, community mapping, careful planning for the area, and organizational strengthening. The people eventually organized themselves into the Barobbob Watershed Occupants Association (BWOA). The provincial government entered into a Land Management Agreement with BWOA awarding a 25-year (renewable) tenure to individual members, thus motivating them to join in soil, water and forest conservation efforts. The squatters have become land managers and the watershed is now a fire-free and poaching free zone with improved potable and irrigation water, and more livelihood opportunities.

The Provincial ENRO of Nueva Vizcaya, through a composite management team, became responsible for the daily activities in the watershed. The team is composed of a forester, an agriculturist, a veterinarian, and a representative of the provincial cooperative affairs office to assist farmers with their business activities. The provincial planning and development office is responsible for monitoring the project.

2. Tree for Legacy - To address the problem of deforestation and waning response to the traditional tree planting activities, the Provincial Government motivated people's participation by providing incentives. This includes guarantees such as ownership and harvesting rights to 'deregulated species' to deserving tree planters (Tree for Education, Enterprise), and usufruct certificates for protection forest (Tree for Legacy). To address sustainability, only 60% of the plantation could be harvested at a time and trees cut would be replaced with new seedlings.

The project area started with 500 ha in 1993 and has expanded to over 2,000 ha in Nueva Vizcaya. There are 2,000 individual participants, 205 schools, 205 Parent-teacher Associations, 230 NGOs and POs, and 26 line agencies involved (Agabayani and Tiongson 2003). The project made the participants forest guards/managers, reduced forest fires, squatting, and timber poaching, provided livelihood and improved potable and irrigation water supply.

3. Lower Magat Forest Management Project – Lower Magat used to be subject to fires, land disputes, erosion and destructive activities. The provincial government of Nueva Vizcaya brokered a co-management agreement with DENR. The LMFMO, chaired by the Governor of Nueva Vizcaya and RED of the DENR Region II and, on authority by the

Sangguniang Panlalawigan, was created for the implementation and monitoring of work plans. DENR and Nueva Vizcaya contributed personnel to LMFMO and the municipalities of Diadi and Bagabag each contributed one personnel to the project office. The project manager came from DENR-PENRO while the coordinator came from the Nueva Vizcaya ENRO.

The DENR appropriated funds for research in forest production and management and ensured the transfer of technologies to LMFMO, communities and individual upland farmers. The provincial government provided the operating budget. LMFMO ensured the maximum participation of legitimate upland farmers, claimants, and indigenous people in the sub-allocation and management of forest lands. It also explored workable and beneficial institutional and business arrangements with the NIA, Department of Tourism, Department of Agriculture, Department of Trade and Industry, NPC, and other public and private organizations. ADB provided huge investments for CBFM.

With management zones planning, around 22% of the forest reserve was tenured through 28 Agro-forestry Land Management Agreements and Community-Based Agro-forestry Land Management Agreements (Agbayani 2002). The project mitigated the problems of fire, squatting, poaching, and livelihood.

4. The CBFM project of the Federation of Vista Hills, Kalongkong Upland Farmers Associations, Inc. – The project won the award for the Model Sustainable Development Project given by the Provincial Council for the Sustainable Development of Nueva Vizcaya in 2003. In 2004, it also won in the Regional Model search by the Regional Council for Sustainable Development (Enriquez 2004). The 3000-ha project was funded by ITTO and assisted by DENR and the Buenavista Upland Development Advisory Council (BUDAC). It was guided by a land use and forest/biodiversity management plan and a local system of monitoring and evaluation. The Eco-tourism project in Sta. Fe has the same governing structure as the Barobbob watershed.

The above examples illustrate how participation of various stakeholders was given high importance for the sustainable management of the watershed. Other cases are the DENR's (REFO-C) project that engaged private contractors, e.g., firms, NGOs, individuals, families, LGUs and civic organizations and its (REFO-A) Program that hired waged labor its reforestation activities.

The nature of coordination, e.g., meetings, consultations, and joint activities among various entities involved in these projects, is facilitated by the project coordinator and is usually on a project need basis. Stakeholders had no prescribed frequency of meetings or consultations within a year but emphasized the need for information and awareness campaign on the importance of sustainable management. Meetings, e.g., on a provincial basis to discuss possible means of managing the area is one strategy for this.

In 2003, there was an attempt to create the Watershed Management Council (WMC) to determine the need, functions, structure and membership, rules and regulations within which institutions operate, and roles and responsibilities of stakeholders inside and outside the watershed. The WMC would thus ensure a regular coordination among stakeholders.

Stakeholders have expressed a favorable response to it but the legislative process is taking some time.

Legal Framework (Political Capital)

The Magat watershed was accorded political support from the national and local level based on the establishment of legal framework, e.g., piece of legislation, directly addressing the watershed or parts thereof.

National Policies. The declaration of the Magat watershed as a forest reservation area through Proclamation 573 of 1969 is a manifestation of the national government's recognition of its significance and concern to protect it.

For accountability as a watershed resource user, Executive Order 281 of 1995 gave NIA the authority to manage, develop, protect and maintain the watersheds located within the Casecnan River Watershed Forest Reserve (CRWFR) in Nueva Vizcaya and the Pantabangan-Carranglan Watershed in Nueva Ecija for the Casecnan Multipurpose Irrigation and Power Project (CMIPP). The CRWFR is included as part of the area proclaimed as Protected Landscape under Proclamation No. 289. However, all cases of clearing, timber cutting and related activities are still coordinated and approved by the DENR.

Other national policy pronouncements are DENR Memorandum Order No. 14 of 1994 to launch the Tree for Legacy Program and the DAO No. 05 of 1993 creating the Center for People Empowerment in the Upland (CPEU).

Interface Between National and Local Level. Sharing of responsibilities, e.g., joint management, was executed through various means such as the ff.:

1. Memorandum of Agreement (MoA) - Joint effort in management of the watershed was generally formalized through a MoA between/among parties concerned, usually the local government units and DENR (Table 12). The MoA stipulates devolution of functions, programs, projects, services and personnel from DENR to LGUs. NPC and NIA also had a MoA shared responsibility over 4,300 hectares for NPC within the Ifugao side.

In 1997, small watershed management areas were established in each municipality through a MoA with DENR. Another MoA over the Sta. Fe Forest Park between the municipal government of Sta. Fe, Nueva Vizcaya and DENR provides for a 25-year duration of tenure renewable for another 25 years.

The MoA on the Tree for Legacy Program intends to restore the depleted forest cover of the province in line with its vision to make the province the watershed haven of Region 2. The program promotes involvement of public and private entities and the civil society in reforestation.

Table 12. Memorandum of Agreement between/among stakeholders on Magat watershed management.

Date	Contracting Parties	Activity
November 9, 1992	DENR-Region 2 and provincial government	Devolving functions, programs, projects, services and personnel of small watershed management areas to each municipality
	Provincial government, Academe, NGOs and POs	Placing 50-ha Bangan Hill under management of 50 NGOs and POs
	DENR and provincial government	Devolving management of Barrobbob watershed to the provincial government
April 1, 1997	NPC and NIA	Transferring 1,017 ha property of NIA to NPC and creation of the Magat Watershed Area Team
July 1997	DENR and provincial government	Placing 24,000 forest lands in Nueva Vizcaya under joint management
September 15, 1997	DENR and provincial government	Joint responsibility to allocate, protect, develop, and manage the forest lands of the province of Nueva Vizcaya
September 22, 1997	DENR and municipal government of Sta. Fe, Nueva Vizcaya	Establishment of the Sta. Fe Forest Park for nature-based tourism covering about 1,000 ha within the 11,664 ha Consuelo Reforestation Project
February 25, 1998	DENR and Province of Nueva Vizcaya	Joint responsibility to allocate, protect, develop, and manage the forest lands in the 24,000 hectare Lower Magat Reforestation Project in Diadi and Bagabag, Nueva Vizcaya
August 7, 1999	DENR-Region 2 and the Provincial Government	Tree for Legacy Program

2. Land Tenure Agreement - The Provincial Government of Nueva Vizcaya and the DENR through the PENRO are co-signatories to a number of tenure instruments awarded under the Lower Magat Forest Management project, i.e., the Agroforestry Land Management Agreement (ALMA), the Tree Farm Lease Management Agreement (TFLMA), or the Community Agro-forestry Land Management Agreement (CALMA) for participating communities. Under the Barrobbob Watershed Management Project, the provincial government also awarded Land Management Agreement (LMA) to farmer-beneficiaries.

3. Certificate of Tree Ownership (CTO) and Certificate of Usufruct (CU) - Under the Tree for Legacy Program of the province, a CTO is awarded to those who plant trees in areas where harvesting timber is allowed while CU is awarded to those who plant fruit trees in areas where the harvesting is not allowed.

4. Certificate of Land Ownership Award (CLOA) – In resettlement lands under CARP, a CLOA for a maximum of 3 ha of land is given to beneficiaries wherein they are allowed to cut, collect and dispose of timber stands for development of the settlement.

Local Policies. The legislative power of LGUs over the natural resources is ensured by the Local Government Code. In effect, LGUs implement and enforce the national forestry laws and regulations. LGU rules related to watershed management are as follows:

1. *Sangguniang Panlalawigan* No. 321-1993 - Resolution enacting an ordinance adopting the rules and regulations on the issuance of sand and gravel permit and other quarry resources.

2. Executive Order No. 64-1996 - Establishing the provincial sand and gravel regulatory board and a monitoring and enforcement team and defining their functions and duties.

3. *Sangguniang Panlalawigan* Ordinance No. 209-1997- An ordinance requiring operators, and haulers in the province of Nueva Vizcaya including non-Vizcaya based sand and gravel operators, contractors and haulers whose trucks traverse the roads within the territorial jurisdiction of Nueva Vizcaya to provide a protective cover of their quarry products while being transported, penalizing violations and for other purposes.

4. *Sangguniang Panlalawigan* Resolution No. 98-138 - Resolution concurring to the MOA dated 25 February 1998 entered into between the Department of Environment and Natural Resources (DENR) and the Provincial Government of Nueva Vizcaya for the Co-management of the 24,000 hectare This led to the creation of the Lower Magat Forest Management Office (LMFMO) in 1999.

5. LMRMS Administrative Order No. 99-01. Guidelines for the Management and Utilization of Forest Resources in the Lower Magat Reserve

6. *Sangguniang Panlalawigan* Ordinance No. 99-013 - An ordinance requiring contractors in the Province of Nueva Vizcaya to plant trees at designated areas in the project site and providing penalty for violation thereof.

7. Barangay ordinances to control and manage natural resources, particularly lumber and water.

Informal Management Practices. The Ifugao watershed model is an example of indigenous resource management system that ensures community involvement, technology applicability, supportive role of culture in forest conservation and sustainable development. The Ifugaos are the indigenous people in the northwestern part of the Magat watershed. Their traditional forest management systems for many generations have been popularly recognized to have contributed significantly to forest development and conservation. The twin objectives of the traditional forest management are: the production of timber and non-timber forest products; and the protection of small watershed of adjacent irrigated rice-paddies. The two major types of activities within the system are private woodlots called "*muyong*" and communal forests called *ala-a*.

1. Private Woodlot Management System (*Muyong* System) - *Muyong* is an Ifugao term for small forest tended for its timber resources. Situated in the upper fringe, ownership is either private or communal. Where it directly supports privately owned paddy fields, ownership is considered private. However, forest acts as a sponge layer that retains rainfall and slowly releases the water for irrigation and domestic use (Butic and Ngidlo 2002).

The *muyong* has remained stable and sustainable as a result of the ingenuity of *muyong* owners in an efficient silvicultural systems and utilization of wood resources. The Ifugaos have learned by experience that *muyong* is vital to the production network within the

whole watershed unit. Without it, the whole production system in the Ifugao landscape will certainly vanish.

2. Communal Forest Management System - Besides the privately owned *muyong*, communal forest (*ala-a*) management system is also important in the context of traditional forest management. The *ala-a* is generally located on lands not cultivated as swidden; lands too far to be covered by a private claim; or lands identified as hunting grounds. The *ala-a* is communally managed for collecting fuel, construction materials, food, medicine and other products that may be used in the household or farm.

Unlike the *muyong*, *ala-a* forests are not systematically maintained to improve the vegetation. Boundaries are not very clear, which can often be a source of conflict. However, use of the *ala-a* is controlled with a consensus that the resource has to be shared. There are two basic rules - no burning, and no gathering beyond what is personally needed. The *ala-a* was not perceived as sources of wood for sale outside the village. However, with the commercialization of woodcarving, people started to harvest trees within the communal areas to generate cash income.

Conflict Management. There are explicit and implicit conflicts between lowland population of the community and highlanders over the natural resources and project inputs. The conflict between the highlanders and lowlanders within the communities is associated with ethnic conflict since most highlanders are Ifugao tribes and lowlanders are Ilocanos. Some conflicts were reconciled through customary laws and amicable settlement at community level and through the mediation of NCIP officials. Other conflicts are over land and water uses.

1. Water use - An example of conflict over water use is that between Saint Joseph Rural Water Works and Sanitation Association (SJRWSA) and Belance Farmers Irrigators Association (BFIA). The conflict between the two associations began in 2001 when the NCIP provided the PhP50,000 assistance to the Saint Joseph Rural Water Works and Sanitation Association for the construction of the intake boxes at the Upper Belance Creek. This serves domestic uses of indigenous Bugcalots and migrant-IPs, namely: Kalanguya, Kankana-oy, Ibaloi, Ifugao, other tribes, and non-IPs residing in the community. BFIA, composed of migrants, filed a protest and petition to the NCIP Nueva Vizcaya claiming exclusive right to Belance Creek by virtue of their water permit for irrigation purposes. Thus, the Provincial Officer delayed the implementation. However, the SJRWSA asserted that it also obtained water permit for domestic purposes and it has been tapping water at Upper Belance Creek since 1998.

To resolve the conflict, NCIP in collaboration with the *Sangguniang Bayan* Committee on Natural Resources conducted consultations and dialogues with the members and officers of the concerned associations. The NCIP commissioner invoked the use of customary laws as provided by IPRA specifically the *Tung-tung* method, a tradition being used by IPs in settling almost all cases. They appealed to the officers and members of BFIA to share water with the SJRWSA for domestic use since they both had permits. Finally, the meeting ended up with the two parties signing a MoA.

2. Land use - One major conflict over land in the watershed is the allocation of the same piece of land for three different uses. These three conflicting land uses are covered by existing legislation, the National Integrated Protected Areas System (NIPAS) Act (R.A. 7586), the Mining Act (R.A. 7942) and the Indigenous Peoples' Rights Act (IPRA) (R.A. 8371). There are vital interests at stake in this conflict: the preservation of biodiversity and unique landscape, the rights of the indigenous peoples in the area, and the investments and potential revenues derived from mining activities. The issue has been address in discussions and negotiation at the community level. The process of negotiation is already at the national level.

3. Tree harvesting rights - Permit to harvest and transport plantation-grown timber is another issue since it is considered a major component of people-oriented forest management projects under DENR and LGUs. Project participants planted fast growing tree species like Gmelina anticipating income when the trees are harvested. However, when harvesting time came, the participants complained that DENR was requiring a permit to affirm the ownership of trees and this would require time and effort. The case has been resolved through the certification of the PO that the owner of trees is legitimate. The PMO eventually issued the permit to harvest and transport to the farmer.

4. Strategic Agriculture and Fishery Development Zones (SAFDZs) - Pursuant to the Agriculture and Fishery Modernization Act (R.A. 8435, s-1997) each municipality of Nueva Vizcaya adopted the SAFDZ through resolutions. The SAFDZ is an area to be used for production, agro-processing and marketing activities. The Provincial Planning and Development Office (PPDO) of Nueva Vizcaya found out that 211,140 ha of the identified SAFDZs are inside forestlands and 19,159 ha are inside proclaimed NIPAS areas. The Magat Watershed Area Team of Nueva Vizcaya informed the PENRO of the situation and discussions and negotiations among municipalities and the DENR are being conducted.

CONSTRAINING AND FACILITATING FACTORS FOR WATERSHED MANAGEMENT

The major constraints in watershed management stem from conflict and disputes among various stakeholders over resource (e.g., land and water) use; weak and unsustainable support from the people and other stakeholders; limited or restrained capacity of LGUs due to inadequate or unclear policy provisions (e.g., Local Government Code) and/or inconsistency of various policies.

Watershed management efforts in the province of Nueva Vizcaya mirror the extent of how Magat watershed was addressed to hurdle the abovementioned constraints. Nueva Vizcaya is the watershed haven of Region 2. It is practically the Magat watershed itself as the province comprises 97% of the watershed area. Magat is a 'lifeshed' providing land and water resources to the populace. It is being conserved with the premise of managing people first, protecting the people first (Agbayani and Tiongson 2003). When social and economic considerations are clear, participation will easily be harnessed. This was the pivotal factor for the substantial financial, technical, intellectual, social/ institutional, and political capital

invested in the Magat watershed. And the catalyst of these efforts was the local government units, e.g., of Nueva Vizcaya, whose militancy and commitment to sustainable watershed management merited such forms of ‘capital investments’.

Political leadership has played a very vital role in protecting the watershed. The resourcefulness and responsiveness of local government executives to social, economic, ecological concerns within the watershed paved the way to a range of solutions. LGUs have accorded high prioritization of watershed management in their budget and were able to build on opportunities such as those provided by the Local Government Code and other policy reforms in the forestry/upland sector.

Local initiatives and innovations that emanated from the constituents catalyzed participatory management efforts in the Magat watershed. These innovations are exemplified by the Barrobo watershed management model, the Tree for Legacy Program, the ITTO-CBFM Project with the Kalongkong Upland Farmers’ Association. The Provincial government whose administration was uninterrupted since 1992 has harnessed not only financial and technical assistance but also direct participation of the government sector, private sector, the academe, NGOs, and peoples’ organizations, and other sectors. The MoAs forged with these various stakeholders attest the linkages the LGUs were able to establish.

These undertakings hinged upon holistic approach to a number of considerations such as: enabling policy and other institutional support; forest resources security; forest protection, biodiversity and soil and water conservation; sustainable flow of forest products; and socioeconomic and cultural well-being. These are manifested in the development of marginal areas into plantations and agroforestry farms, protection of natural and secondary forests from illegal entry and poaching, prevention of forest fires and regeneration of forests and improvement of stocks through enrichment planting.

In managing conflict, appropriate incentive schemes and regulatory measures encouraged stakeholders’ participation to engage in ecologically sound practices in watershed resource utilization and protection. These measures and incentives were in the form of co-management agreement, tenurial arrangement such as Agroforestry Land Management Agreement, the Tree Farm Lease Management Agreement, and the Community Agro-forestry Land Management Agreement. Harvesting rights were granted through Certificate of Tree Ownership (CTO). This was instrumental in the transformation of squatters into ‘area managers’ and in providing supplemental income generating activities. Indigenous people’s rights and watershed management practices were also recognized.

Lessons could be distilled from the watershed management models done in the area, e.g., the Tree for Legacy, the Barrobo watershed project, the CPBFM project of Federation of Vista Hills-Kalongkong Upland Farmers Associations, Inc. Moreover, the formation of watershed management units such as the Lower Magat Forest Management Office (LMFMO), the Buenavista Upland Development Advisory Council (BUDAC) could also serve as examples of local institutional innovations for watershed governance.

CONCLUSIONS

The Nueva Vizcaya experience generates a number of lessons. The management approach adopted in the province treats watershed as a 'lifeshed' where human concerns are connected with land and water resources. Managing people first, i.e., dealing with their interests in relation to the use of watershed resources, should be the premise in managing the watershed. An effective management support system is essential to ensure that the factors to facilitate watershed management are in place.

The competence and motivation of the actors involved to protect watershed resources is very important. One critical role is that of LGUs. The political leadership must be capable of capitalizing on existing policies (e.g., Local Government Code) to augur well for their watershed management initiatives. The LGUs should also harness a participatory approach to managing watershed resources. The LGU executives should be resourceful enough to tap national government, e.g., DENR, and international organizations for technical and financial support.

Partnership should be established among various stakeholders, e.g., between DENR for its technical expertise and LGUs for its capacity to gain peoples' support. Co-management or joint stewardship over resources, e.g., between LGU and NGO/PO, is also a strategic practice. 'Lifelines' such as the abovementioned incentives should be in place to encourage people to join in participatory management schemes and to adopt conservation practices. The 'feeling of control and sense of ownership' paves the way for sustainability. Therefore, to sustain the watershed, efforts to enhance capacity on both individual and organization basis should also be sustained.

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Appendix A

Old Course Content (BS Forestry)

Republic of the Philippines
NUEVA VIZCAYA STATE INSTITUTE OF TECHNOLOGY
Baybong, Nueva Vizcaya

COLLEGE OF FORESTRY

SYLLABUS IN FRM 25 (Watershed Management)

- I. COURSE NUMBER: FRM 23
- II. COURSE TITLE: WATERSHED MANAGEMENT
- III. COURSE DESCRIPTION
Regulation, use, conservation practices and treatment of the aggregate resources of a drainage basin for the production of water and the center of erosion, streamflow and fields.
- IV. CREDIT: 3 units
- V. COURSE CONTENT
 1. *General view of the course*
 - a) *Definition of terms*
 - b) *Concept of Watershed Resources Management*
 - c) *Watershed Management Objectives*
 - d) *Phases of Watershed Management*
 - e) *Watershed Characterization*
 2. *Hydrologic Cycle*
 - a) *Components of hydrologic cycle*
 - b) *Precipitation*
 - c) *Interception*
 - d) *Infiltration/Percolation*
 - e) *Runoff*
 - f) *Water losses*
 - g) *Instrumentation*
 3. *Watershed Management in the Philippines*
 - a) *Policies/Agencies involved*
 - b) *Programs*
 4. *Streamflow*
 - a) *Measurement of streamflow*
 - b) *Hydrograph*
 - c) *Unit hydrograph*
 - d) *Return Period*
 5. *Soil Erosion and Sedimentation*
 - a) *Types of soil erosion*
 - b) *Factors that affect soil erosion*
 - c) *Effects and control of soil erosion*

6. *Vegetation Manipulation for Water Yield*
 - a) *Vegetation treatment/manipulation*
 - b) *Water yield response*

New Course Content (BS Forestry)

Republic of the Philippines
Nueva Vizcaya State University
 Bayombong, Nueva Vizcaya

College of Forestry

WATERSHED MANAGEMENT
 (Second Semester, 2003-2004)

Course No. : FRM 23

Course Title : Watershed Management

Course Description

Regulation use, conversion practices and treatment of aggregate resources of drainage basin for the production of water and control of erosion, streamflow and floods.

Credit : 3 units

No. of Contact Hours/Week

Lecture : 2 hours
 Laboratory : 3 hours

Course Content

I. Introduction

II. Current State of Watershed Management in the Philippines

III. Basic Concepts in Watershed Management

1. *The Watershed*
2. *The Watershed as a System*
3. *Watershed as the Basic Unit in Land-Use Planning*
4. *Watershed Management Objectives*
5. *Watershed Management Problems*
6. *Watershed Management Strategies*

IV. Watershed Characterization

1. *The Biophysical Features*
 - a) *Geomorphological Features*
 - b) *Soil Characteristics*
 - c) *Land Capability*

- d) *Climatic Features*
- e) *Runoff Variables*
- f) *Vegetation*
- g) *Wildlife*
- h) *Land Use*
- 2. *Socioeconomic*
- V. *Watershed Meteorology and Hydrology*
 - 1. *Meteorological monitoring*
 - a) *Rainfall*
 - b) *Air temperature*
 - c) *Relative humidity*
 - d) *Solar radiation*
 - e) *Wind*
 - 2. *The Hydrologic Cycle Process*
 - a) *Evaporation*
 - b) *Evapotranspiration*
 - c) *Transpiration*
 - d) *Precipitation*
 - e) *Interception*
 - f) *Infiltration*
 - g) *Surface runoff*
 - h) *Streamflow*
 - i) *Percolation*
- VI. *Water Augmentation*
 - 1. *Vegetation management*
 - 2. *Water harvesting*
 - 3. *Cultural/Management Practices*
- VII. *Soil Erosion*
 - 1. *Mechanics of soil erosion*
 - 2. *Importance of Soil Erosion*
 - 3. *Factors affecting soil erosion*
 - 4. *Estimation of Soil Erosion*
 - a. *Signs of the occurrence of erosion*
 - b. *Field Methods*
 - c. *Empirical Equations*
 - 5. *Soil Loss Tolerance*
 - 6. *Soil erosion control measures*
- VIII. *Water Quality Characterization*
 - 1. *Physical Characteristics*
 - 2. *Chemical Characteristics*
 - 3. *Bacteriological Characteristics*
- IX. *Watershed Management Planning*
 - 1. *Multiple Use Concept*
 - 2. *Sustainable Watershed Management*
- X. *Special Topics*
 - 1. *Geographic Information Systems*

List of Exercises

<i>Exercise No.</i>	<i>Title</i>
1	<i>Area Determination</i>
2	<i>Geomorphological Characterization</i>
3	<i>Rainfall data Analysis</i>
4	<i>The Water Budget</i>
5	<i>Wind Characterization</i>
6	<i>Relative Humidity</i>
7	<i>Infiltration Assessment</i>
8	<i>Runoff Assessment</i>
9	<i>Soil Erosion Measurement</i>