Winning the Water War

watersheds, water policies and water institutions

edited by
Agnes C. Rola, Herminia A. Francisco
and Jennifer P.T. Liguton

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Philippine Institute for Development Studies
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Foreword

With the rapid increase in the country's population and its corresponding increased economic activities, the demand for water usage for various purposes, such as domestic, agricultural, industrial and commercial, is expected to likewise expand exponentially.

Studies show that the given volume of water available in the country may, in the near future, be almost outstripped by such growing demand, especially in certain regions of the country. Moreover, water sources and the ecosystems supporting them are continuously being degraded, making available water supplies contaminated and thereupon further reducing the amount of water that is potable and safe in quality for domestic, agricultural and commercial uses.

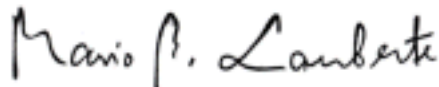
Certainly, all these point to one thing: our water is facing serious threats. Scarcity, degradation, depletion, wastage and mismanagement—all these describe the conditions which our country's water resources are in today. This is our "water war" and all of us who have stakes in our water resources must therefore act *now* to ensure that we win this war.

This book offers some possible ways to win this war. Zeroing in on an integrated approach that looks at the problem of water from both the supply and demand aspects, the book espouses the adoption of the watershed-based approach to water resources management and views the need to plan and manage water resources on the basis of an ecosystem setting, in particular, the watershed unit.

After going through the elements that constitute this approach as well as through the discussions on how our understanding of watersheds must "go beyond the forestland" and on what supporting mechanisms—legal, policy and institutional—must exist for the approach to succeed, one may perhaps begin to ask if this approach, once all such elements are present,

may indeed be the answer to having an integrated water resource management program in the country.

If it is, the challenge is how to push for, implement and institutionalize it. The experiences shown in the case illustrations in this volume prove that it can be done. As such, on behalf of the PCARRD, our copublisher, and the USAID, which provided the funds for this publication through the SANREM CRSP/SEA, it is my hope that this volume will contribute to the concretization of this challenge.



MARIO B. LAMBERTE
President, PIDS

Acknowledgement

This book contains the papers presented during the Water Resource Management Policy Forum sponsored and organized by the Philippine Institute for Development Studies (PIDS) and the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), under the auspices of the Sustainable Agriculture and Natural Resources Management Collaborative Research Support Program for Southeast Asia (SANREM CRSP/SEA). This was held in Makati City in August 2002. Four additional papers were solicited after the forum. The conduct of the water forum was part of the scaling up to the national level of the water policy and institutional issues learned from a decade of field level research work in Bukidnon. The forum also fulfilled the contract made by Agnes Rola with the University of California-Berkeley's BEARHS Environmental Leadership Program (ELP) that she attended in July 2001.

The completion of this book will not be possible without the help and support of many individuals and institutions. We would therefore like to take this opportunity to thank all of those who have contributed to the fruition of this endeavor.

Two individuals provided the initial encouragement and inspiration for this. Dr. Cristina C. David of the PIDS encouraged the holding of the water policy forum and aided in identifying the participants. Dr. Ian Coxhead of the University of Wisconsin-Madison, in his capacity as Regional Program Manager of the SANREM CRSP/SEA, had long wanted and envisioned to communicate field level research results to policy.

The discussants during the forum who unselfishly shared their time and expertise as well as those who sent in their comments and suggestions after the forum are hereby gratefully acknowledged. These include the following: Mr. Vic Abrogueña of the Bukidnon Community Development

and Resources Council, Dr. Rex Cruz of the Environmental Forestry Program of the UPLB, Dr. Florentino Tesoro of the Department of Science and Technology (DOST), Ms. Alicia Bongco of the Laguna Lake Development Authority (LLDA), Atty. Mai Flor of the Business Development Philippines, Mr. D. Pascua of the National Irrigation Administration (NIA) and Congressman Nereus Acosta of the 1st District of Bukidnon. Special mention should be given Dr. Lope Villenas, who represented the Executive Director of the National Water Resources Board (NWRB), for pointing out the shortcomings in the implementation of the Water Code as well as other water resource policy concerns. This book has benefited from their insights and their experiences.

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Special acknowledgement should also be given to the reviewers of the chapters of this book in their draft form. Foremost is Dr. Gilberto Llanto, vice-president of the PIDS, who painstakingly critiqued and reviewed the various chapters and offered very helpful suggestions that greatly contributed to the refinement of the individual papers of this book. Ateneo de Manila Professor Dr. Germelino Bautista's comments on Chapter 8 and the lessons drawn from its experience are also highly appreciated. Ditto with Engineer Luis Sosa's (of the CTI Engineering Co. Ltd.) comments and suggestions on Chapter 5.

We also wish to thank the staff of the Research Information Department of the PIDS for their help and involvement in the various aspects of the

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THE EDITORS

1 Toward a win-win water management approach in the Philippines

Agnes C. Rola and Herminia A. Francisco

Introduction: Why the need for water management

As economies develop and population increases, demand for water by industry, commercial, agriculture, and domestic sectors necessarily expand. Globally, the supply of water[1] may not be limited. Rosegrant et al. (2002), for instance, made the projection that for 2025, only 10 percent of total renewable water shall have been withdrawn. Yet, there are spatial variations in water supply conditions. In the Asia-Pacific region, in particular, only a small portion of the renewable water sources can be tapped, even if, statistically, the per capita annual use of 400 cubic meters (m^3) is only 12 percent of the 3,360 m^3 per capita renewable water resources in the area (Webster and Le-Huu 2003). This pattern was also noted in the Philippines, where the annual water use accounts for only 12 percent of available supply (FAO 2002).

Viewed in isolation, this figure tends to suggest that the need to manage water use and conserve water resources in the region and in the Philippines, in particular, is not a pressing concern. Several facts, however, quickly dispel this notion.

First, the per capita water availability has been declining over the years (Webster and Le-Huu 2003). This situation is brought about, on one hand, by increased water demand arising from economic growth and population increases, and, on the other, by decreased water supply associated with degradation of forest watersheds in the country.

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[1] "Water supply" refers to water available for use from many sources. Total water availability is the sum of renewable water, artificial basin/regional water transfer, desalinated water, nonrenewable groundwater, and salt water.

Second, the data on aggregate availability are illusory in that they indicate the *average* supply per capita per year, without regard to the *distribution* of available supply. True availability is contingent on time, place, quality, and cost. The Philippines, like all other Asian developing countries, has regions and times of year in which water for specific uses is scarce.

Finally, the Philippine freshwater ecosystem faces severe problems of pollution and rising costs of potable water supply. Surface water accounts for about three quarters of freshwater supply, but many of the major rivers and lakes, particularly those passing through or close to urban centers, are heavily polluted.

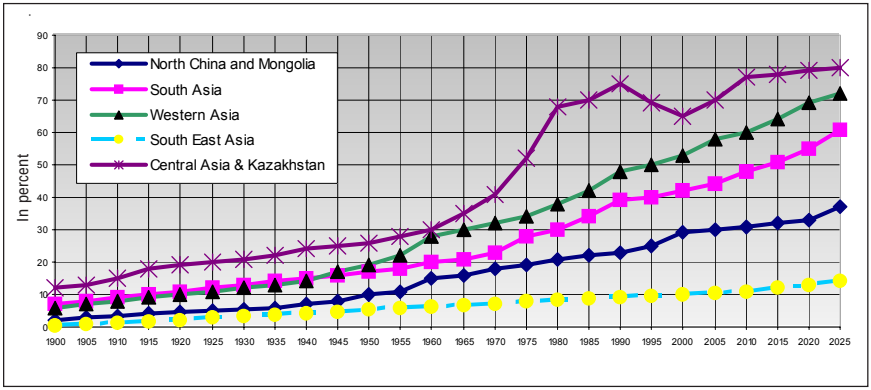
The issue of whether water scarcity is real in the Asia-Pacific region and in the Philippines, in particular, is discussed in detail in the succeeding part of this section. The analysis focuses on spatial differences in water availability and water quality situation in the country.

Water stock, flow, and use

The literature reports that globally, water withdrawals have increased by over six times during the last century, or at more than double the population growth rate (Webster and Le-Huu 2003). Within the Asian-Pacific region, net water withdrawals are highest in Central Asia, followed by Western Asia, and South Asia (Figure 1). Southeast Asia has the lowest net water withdrawal trends. Among the Southeast Asian countries, however, the Philippines was observed to have the highest total withdrawals in 1990, followed by Vietnam (Table 1). Projections up to 2025 show that the Philippines will still have the highest withdrawal as a percentage of annual water resources (Seckler et al. 1998) among Southeast Asian countries.

The above figures show that the Philippines has to prepare a water resources management plan as water withdrawal will sooner or later catch up with the available water supply, given current trends. The Philippines is aware of this situation and has indeed come up with a National Water Resources Management Master Plan based on a Japan International Cooperation Agency (JICA)/National Water Resources Board (NWRB) 1998 study. The plan has two components: a) development of water resources to meet increasing water demand; and b) strengthening of the water management institution.

Figure 1. Water withdrawal trends versus availability



Source: Webster and Le-Huu 2003

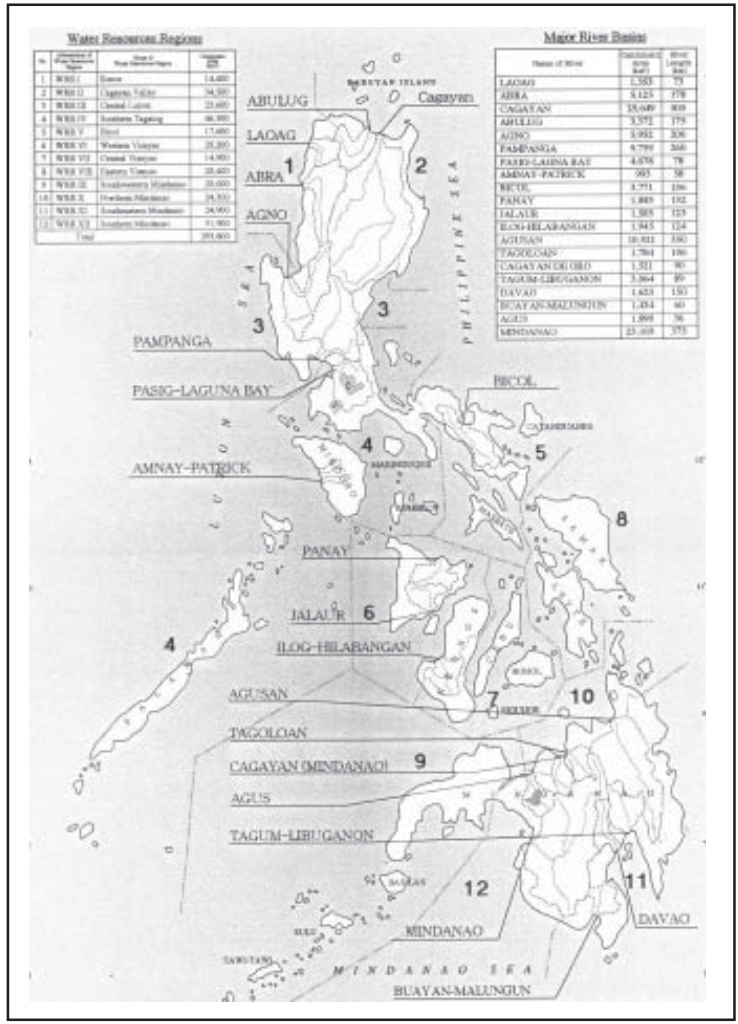
Table 1. Southeast Asia: water supply and demand

Country	Total Annual Water Resources (AWR) Km3	Total Withdrawals (DWR) Km3			
	1990 data	1990		2025[1]	
		DWR	percent of AWR	DWR	percent of AWR
Cambodia	498.1	0.6	0	0.8	0
Indonesia	2530.0	17.5	1	24.2	1
Malaysia	456.0	13.7	3	18.6	4
Myanmar	1082.0	4.2	0	5.4	0
Philippines	323.0	41.7	13	49.8	15
Vietnam	376.0	27.6	7	31.2	8

[1] International Water Management Institute (IWMI) Projections
Source: Seckler et al. 1998

For purposes of planning, the NWRB, the regulatory arm of the Philippine government for water management, has divided the country into 12 water resources regions (WRR). A water resource region divides the country by hydrological boundaries for comprehensive planning of water resources development. Figure 2 shows the location of the water resources regions and the major river basins of the country as opposed to Figure 3 which shows the political dimensions of the country. The Philippines has 343 principal river basins that have at least 40 square kilometers

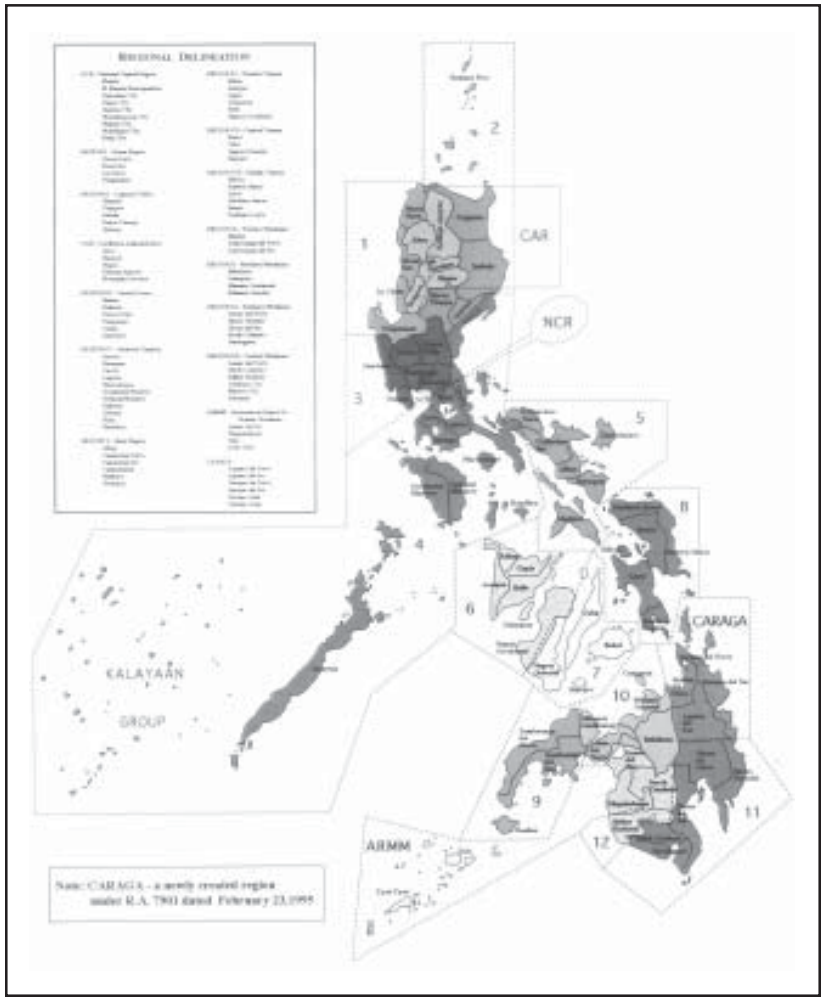
Figure 2. Location of water resources regions and major river basins



(km²) of basin area. Of these, 20 river basins with at least 990 km² of basin area are identified as major river basins. These 20 major river basins account for 37.1 percent of the total land area of the country and 55.7 percent of the total area of the principal river basins.

Politically, meanwhile, the country is divided into 16 administrative regions. These, however, are not congruent with the water resources

Figure 3. Provinces in each administrative region



regions. As such, there is no administrative unit that manages the water resource regions. The operationalization of planning at the water resource regions thus remains elusive, at best a plan.

In terms of differences across the country, the projections for 2025 show that in a high-economic growth scenario,[2] the water balance, which

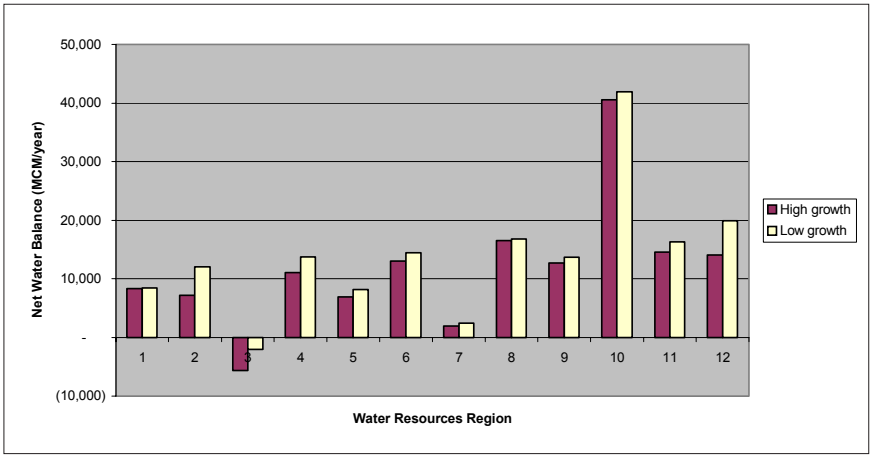
[2] This is based on the projections of the economic growth by the National Economic and Development Authority.

is the difference between the amount of water resources potential and the water demand, will be negative for Central Luzon (Figure 4). This situation is largely due to a rising water demand in Metro Manila. Also, while water balance is positive for the Visayan regions, it is barely positive for Region VII, where Metro Cebu, a water-scarce city, is situated. All Mindanao regions have positive water balances (JICA/NWRB 1998). In the low-economic growth scenario, Central Luzon region is still projected to have a negative water balance.[3]

In a study of the water balance of the major river basins in the Philippines, it shows that 17 of the 20 major river basins will experience water shortage until 2025. This is projected to happen in the high-economic growth scenario and on the assumption that there is no water resources development program (Table 2). The river basins in Luzon will face the most serious shortages until the year 2025.

In the urban centers of the country, serious problems are now being felt. Based on the projected demand and the current exploitable groundwater sources, all the major cities of the country will in fact need addi-

Figure 4. Balance of water resources potential and water demand in 2025 (50 percent dependability)



Source: JICA/NWRB 1998

[3] These projections were made in 1998 when big businesses had not yet settled in Mindanao. Most agribusiness firms and agriculture areas are located in Central Luzon.

Table 2. Major river basins likely to cause water constraint until year 2025

No.	Major River Basin	Water Resources Region	Location
1	Laoag	WRR I	Luzon
2	Abra	WRR I	Luzon
3	Cagayan	WRR II	Luzon
4	Abulug	WRR II	Luzon
5	Agno	WRR III	Luzon
6	Pampanga	WRR III	Luzon
7	Amnay-Patric	WRR IV	Luzon
8	Bicol	WRR V	Luzon
9	Panay	WRR VI	Visayas
10	Jalaur	WRR VI	Visayas
11	Ilog-Hilabangan	WRR VI	Visayas
12	Tagoloan	WRR X	Visayas
13	Cagayan de Oro	WRR IX	Mindanao
14	Tagum Libugannon	WRR XI	Mindanao
15	Davao	WRR XI	Mindanao
16	Buayan-Malungon	WRR XII	Mindanao
17	Mindanao	WRR XII	Mindanao

Source: JICA/NWRB 1998

tional surface water sources in 2025 (Table 3). Metro Manila, Metro Cebu, and Baguio City are found to have the most critical water balance conditions (JICA/NWRB 1998). In Metro Manila, the projected total water demand for the Metropolitan Manila Waterworks and Sewerage System (MWSS) service area for the year 2010 is 1,898 million cubic meters (mcm) (Abracosa 1997). Of this projected demand, MWSS will only be able to supply 80 percent.

In the Central Visayan region, Cebu's water supply system has been unable to meet growing demands since the early 1970s (Abracosa 1997). Metro Cebu's water demand is currently placed at 234,000 m^3 daily. Of this, the water district is only able to supply 45 percent. This water demand is roughly equivalent to some 85 mcm of groundwater withdrawal annually, which is way above the estimated 58 mcm of annual recharge to the groundwater system. The other source of water is surface water, which is directly correlated with the health of the watersheds in the area. Currently, however, the amount of Cebu's water resources is difficult to estimate for lack of data on the water balance of the surrounding watersheds.

Table 3. Projected water demands in water-critical urbanized areas

Major City	Exploitable Groundwater (MCM/Year)	Water Demand (MCM/Year)		Ratio of Demand in 2025 to Demand in 1995
		In 1995	In 2025	
Metro Manila	191	1,068	2,883	2.7
Metro Cebu	60	59	342	5.8
Davao City	84	50	153	3.1
Baguio City	15	12	87	7.3
Angeles City	137	11	31	2.8
Bacolod City	103	37	111	3.0
Iloilo City	80	9	47	5.2
Cagayan De Oro City	34	29	98	3.4
Zamboanga City	54	28	203	7.3

Source: JICA/NWRB 1998

In Baguio City, where data on the supply and demand are not available, the JICA/NWRB (1998) study cites the water supply situation to be "serious." The Baguio City Water District has been facing problems caused by the deteriorated water supply system and insufficient water supply capacities. On the average, 80 percent of the total number of service connections amounting to 21,500 get water following a four-hour, thrice-a-week schedule (JICA/NWRB 1998). No running water is available due to low water pressure, especially in the elevated areas.

Water quality issues

As indicated earlier, water scarcity is projected to be more intense in some regions than in others. This situation is made more serious by the deteriorating water quality conditions, especially in some urban centers of the country. A recent study by the Department of Environment and Natural Resources (DENR) shows that 180 of the 421 rivers and other bodies of water nationwide are so heavily polluted that they may soon be declared biologically dead (*Philippine Star* 2001). Fifty of the major rivers are now considered "biologically dead," a term used to describe places that no longer support any life form because of overpollution. Among these are four rivers in Manila, four in Cebu, and four in Negros Occidental (DENR 1998).

The main river systems in Metro Manila are biologically dead while siltation and chemical residues pose a serious problem to major lakes, including Laguna Lake, Lake Danao, Lake Lanao, and Lake Leonard (Republic of the Philippines 1998). This situation shows that ensuring potable water supplies to households will become more costly as water treatment requirements increase.

The three main causes of river death are a) improper waste disposal, b) water pollution from industrial sources, and c) agricultural use and degradation of the forest reserve, leading to soil erosion and sedimentation (LOGODEF 2000). The increase in population and economic activities has considerably increased the effluents being discharged to water bodies. Domestic sewage has contributed about 52 percent of the pollution load while industries account for the remaining 48 percent (NSCB n.d.). Other sources of water pollution are inefficient and improper operation of landfills or incinerators and inadequate public cooperation on the proper disposal of sewage and solid wastes.

Toxic red tide outbreak in Manila Bay occurs regularly, which simply shows the extent of degradation of this resource. Relatedly, available data also point to an increasing incidence of water-borne diseases, such as typhoid and paratyphoid, diarrhea, H-fever, malaria, schistosomiasis, and cholera.

In sum, therefore, the current state of water resources in the Philippines should be cause for concern among policymakers. Water scarcity is serious enough in certain parts of the country, and the situation is not expected to improve unless efforts on both the supply and demand sides of water management are exerted.

Addressing the water scarcity problem

As pointed out earlier, water scarcity exists in certain areas due to water availability limitations, depletion of groundwater resources, degradation of freshwater sources, and the increasing cost of new water source development.

For the Asia-Pacific region, the literature contends that water shortages will become a major constraint in the economic and social development of the region's individual countries unless equitable and efficient water allocation policies and mechanisms are developed (UNESCAP 2000).

Three issues need to be addressed in discussing water scarcity problems, namely: a) managing water supply, b) managing water demand, and c) establishing supportive social, legal, and institutional support systems for effective water management. In this regard, management models of biophysical nature are numerous (Dixon and Easter 1986; World Bank 2001). Policy models at the global level also exist (Rosegrant et al. 2002). But none of these includes local basin or watershed management models and the policy systems and institutional setups needed to support local (subnational) and national water management (Rosegrant and Meinzen-Dick 1996) inasmuch as these depend on site- or watershed-specific conditions.

This book seeks to contribute to the literature by providing a holistic analysis of the water supply situation whereby it focuses on supply and demand conditions as well as on the social, legal, and institutional context of the problem. It specifically calls for the need to look at the water issue in an ecosystem-setting—specifically that of a watershed unit. It also underscores the need to treat water as an economic good, thus allowing markets to allocate water to competing uses while recognizing the role of the government to protect the interest of targeted social groups in society. Finally, it defines the social, legal, and institutional supports needed to make watershed-based water management strategy a reality in the Philippines. These various elements are discussed in specific chapters of the book.

This chapter summarizes the points raised in different parts of the book and presents a synthesis of the various elements of what should constitute a watershed-based water management model or framework. It also provides general directions that may facilitate the implementation of this framework.

Watershed-based water resources planning

"Watershed,"[4] which is also called "catchment," refers to areas that supply water by surface or subsurface flow to a given drainage system, be it a stream, river, or lake. A watershed is a hydrologic unit that has been described and used both as a physical-biological unit and as a socioeco-

[4] Also defined in Box 1. A river basin is similarly defined (Dixon and Easter 1986) but is of a larger scale.

nomic and sociopolitical unit for planning and implementing resource management activities. It is viewed both as a water supply and a water distribution system, with finite resources made available to various users.

The *watershed approach* to water resource management, which is of a smaller scale compared to the *integrated river basin management* in the developed world (see Box 1 for terminology descriptions), is being proposed in this volume. A watershed approach to water management is needed for the reasons Dixon and Easter (1986) cite in Table 4.

Francisco in Chapter 2 argues that while watershed management has long been an element of natural resources planning and management by the DENR in the country, it has been largely limited to the upper watersheds, where forests lie. The link between the upper watershed and the downstream water resources has not really been tackled in the context of a watershed unit.

Meanwhile, the multiple goods and services that the country's upper watersheds offer and the virtually open-access status of a large part of this area have encouraged unregulated removal of forest cover and land conversion that further contribute to watershed degradation. The author underscores the need to implement water resource planning by linking this to the overall conditions of the watersheds—particularly, the upper wa-

Box 1. Watersheds, catchments, and basins defined

A **watershed** is the divide between two areas drained by different river systems. Common usage over the years has resulted in "watershed" coming to mean not only the divide itself but also the natural drainage area within that boundary.

Catchments and **basins** are the natural drainage areas within the boundary defined by the watershed divide.

Watershed and **catchment** are essentially the same, but *basin* (often *river basin*) is most often used to describe a region drained by a larger river system, implying a very large watershed or catchment.

Source: http://lnweb18.worldbank.org/ESSD/ardext.nsf/18ByDocNameSectorsand Themes WatershedManagement

Table 4. Rationale for a watershed approach to water resource management strategy (modified from Dixon and Easter 1986)

1. The watershed approach is logical for evaluating the biophysical linkages of upland and downstream activities because these are linked through the hydrologic cycle within the watershed.
2. Land-use activities, water uses, and other upland disturbances often result in a chain of environmental impacts that can readily be examined within the watershed context.
3. The watershed approach has strong economic logic. Many of the externalities involved in alternative land management practices affecting water supply and quality are internalized when the watershed is managed as a unit.
4. The watershed approach provides a framework for analyzing the effects of human interactions with the environment. The environmental impacts within the watershed operate as a feed back loop for changes in the social system.

tersheds. She then cites various cases where watershed approach has been implemented, both in the country and abroad, and identifies critical elements for their successful implementation. Among these are a) strong political support and targeted budget allocation, b) strong leadership and commitment by relevant stakeholders, c) effective interagency collaboration, d) clearcut legislative action, e) sustained information, education and communication campaign, and f) the ability to raise revenue for watershed protection and management.

The watershed management realities are articulated in an Annex to Chapter 2 authored by Acosta. According to Acosta, at least twelve programs and projects have been implemented to operationalize watershed approach in the Philippines since the late 1960s to the present. Admittedly, however, all of these programs were limited only to the upper (forest) portion of the watershed and were not in any way linked to water supply management. The author also notes serious gaps in policy and legislation that constrained the full implementation of programs and projects, resulting in failure to arrest the rapid rate of watershed degradation.

Improving water governance structure

The main problems in the water sector that are explicitly and implicitly articulated by several authors in this book are a) the failure to implement the laws governing watershed approach, b) the absence of institutional mechanisms to operationalize said approach, c) the lack of appreciation of water as an economic good; hence the inability to allow market-based mechanisms to function, and the c) lack of mechanisms that will integrate water and watershed plans and programs of various agencies. In a way, they all relate to the issue of water governance.

Malayang in Chapter 3 of this volume describes water governance in terms of structure and dynamics, and presents a theoretical model to this effect. Water resource governance is a body of decisions and actions directed at, or which affect, the conditions and use of water. These are formed and undertaken by groups and institutions from either the public or the private sectors that are concerned with or mandated to address water issues. Malayang's theoretical model assumes that decisions and actions that tend to dictate how water resources are developed, protected, managed, or used across a social or political landscape are likely to be those preferred, or which have been agreed upon, through consensus or compromises, by water institutions that have the most power in this particular landscape to sway human conduct toward a certain behavior.

Power, as described in Malayang's model, is the construction of a water institution's public legitimacy, trust, and credibility. Water institutions, according to the author, gain power when they have widespread public confidence on a) their mandates to address water issues, b) their ability to promote public rather than individual or elite interests on water, and c) their technical and organizational capabilities to address these issues and problems. Hence, water policies are indeed the creations of power. Water institutions that have more power will dominate water policies. In turn, water policies will tend to be more stable and precise if they are composed of water decisions and actions adopted by a wide array of institutions.

The model drives home the point that water resource management is a "construction of the ecology of power of water institutions." The chapter presents a case (i.e., Pampanga river) that operationalizes the model of governance and concludes that there is a "virtual impasse on what decisions and actions should dominate and comprise the policy on water."

Following the theoretical model of Malayang, Elazegui in Chapter 4 concurs that efforts to manage the water resources and their ecosystems and watersheds are considered weak on account of the presence of several agencies dealing with water resources, water quality, watershed resources, irrigation, energy/hydropower, domestic water supply and other water-related concerns. Since these agencies belong to different executive departments, the coordination of activities on issues that affect one another is difficult.

While there may be nothing wrong in involving a number of institutions in water governance, no legal basis exists that supports the coordination and complementation of the different functions of the institutions/agencies involved. In addition, no institutional leader has the overbearing power and budget to govern water resources management in the country. What the country has are different agencies with separately vested powers over water and watershed management. Gaps in policies and coordination at the national level thus constrain the full implementation of the watershed approach in natural resource management.

The situation is equally complicated at the local level where the local water districts operate. These water districts have no direct jurisdiction over the watersheds supporting their water supply. The Local Government Code of 1991 stipulates that the local government units (LGUs) should be responsible for protecting watersheds. But this Code has not been fully implemented since control over the country's natural resources still lies with the DENR. Admittedly, however, the DENR is slowly recognizing the role of LGUs in this effort and has launched several initiatives, such as the ECOGOV Project and the GOLD Project,[5] to train LGUs in natural resource management. Some watersheds are also now managed by LGUs under co-management agreements with the DENR. Certain watersheds are also under the control of a number of agencies that are dependent on watershed resources such as the National Power Corpora-

[5] The Philippine Environmental Governance (ECOGOV) project is a technical assistance grant from the United States Agency for International Development (USAID) to the Government of the Philippines which aims to strengthen the ability of LGUs in addressing critical threats to the country's coastal and forest resources and assess and implement integrated solid waste management (ICWM). On the other hand, the Governance and Local Democracy (GOLD) Project is another USAID-funded project in the Philippines which assists provinces, cities and municipalities in actively participating in the assessment, monitoring and management of natural resources in their respective jurisdictions.

tion (NPC) and the National Irrigation Administration (NIA). A recent addition to this set of water managers is the stipulation in the Indigenous People's Rights Act where indigenous communities are to be administrators of the country's watersheds within their domains. The multiplicity of institutions governing watersheds in the country and the lack of coordination among them do not support a holistic approach to water resources management and are aspects that need to be addressed in the overall efforts to improve water resource management in the country.

Competing water use and allocation mechanisms: economic instruments for demand management

In the Philippines, the task of resolving allocation conflicts among competing interests and managing the water supply is becoming more complex (Tabios and David, Chapter 5 of this volume). Allocating water rights by command and control and treating the raw and bulk water resources as a free good despite growing scarcity has promoted wasteful use and has caused water to be misallocated to less valuable uses. It also failed to raise the revenues needed to support management efforts on these watersheds. A key instrument for achieving efficiency and sustainability in water resource management is to reflect the social opportunity or scarcity costs of water in water production and consumption decisions. The full financial cost of water supply development and management and the environmental costs of such use should be reflected in the price of water.

Tabios and David cite four cases that illustrate the problems and issues underlying the competing uses of water in the major watersheds and water-scarce cities in the Philippines. Conflicts in water use and water resource degradation in these areas could be partly addressed by instituting correct water pricing and allowing water markets to be the water allocator. The authors further contend that a clear definition of water rights is critical in the efforts to price water appropriately and create water markets. They likewise raised the need to invest in generating water-quality data and in doing comprehensive groundwater quantity and quality study in order to increase the accuracy of water supply projections.

In Chapter 6, Francisco reviews the various water allocation mechanisms that include a) public allocation, b) user-based allocation, c) full-

cost pricing, and d) allocation by setting water markets. Public allocation is geared toward satisfying societal goals such as equity considerations. This is the case in water-deficient areas, where the private sector is not willing to invest but where water demand by a great number of people has to be met. While government intervention in this instance is justified, there is a general tendency to waste water since water that is priced so low tends to be used excessively.

There are also situations where water rights are vested in certain user groups, particularly in the case of irrigation water and water used for hydropower generation. While this is necessary to ensure that specific sector groups get the water that they require, there is also a need to assess such allocation when these needs are met at the expense of some other uses. In such a situation, it makes economic sense to price water to reflect the foregone values of the alternative uses as their opportunity costs. Again, the call is to price water more appropriately than is currently practised. Water pricing as a general policy, however, needs to be supported by appropriate legislation that will define who can charge raw water price and how user charges should be managed and spent. The author argues that part of such charges should be earmarked for watershed protection and management initiatives.

In recent times, too, the call for the provision of environmental service payments to those who provide such services like watershed protection has gained considerable ground. This move in effect recognizes watershed protection as an input to the "production" of water. Such payment can be made in cash or in kind to those who perform the service by those who benefit from such an environmental service. The author notes that the payments can be collected as part of consumers' water bills. She cautions, however, that such a move must be supported by strong information, education, and communication campaigns to get broad public support. How one could tap the payments of the beneficiaries of environmental service like watershed function is one of the major challenges in demand management for water resource improvements.

The absence of water allocation mechanisms and correct water pricing policies can also induce water degradation in light of rapid economic development. This is shown in Chapter 7 as Coxhead links the broad economic policies to land use and the corresponding effect on water resources in a specific watershed in Mindanao—Lantapan, Bukidnon. The

chapter highlights the need to integrate environmental policies with economic development policies and shows in a case study the impact of trade and agricultural price policies on surface water quality and quantity in upland ecosystems.

The study area is a typical upland community, where, for almost a decade, intensive data gathering, analyses, and development activities at the farm, community, project, and local government levels have taken place. The evidences generated strongly support two arguments.

First, the natural resource base of the watershed is undergoing degradation with potentially serious consequences, especially in terms of water quantity and quality (Deutsch et al. 2001).

Second, much, if not most, of the degradation can be attributed directly or indirectly to the spread of intensive agricultural systems based on corn and vegetables, without the concurrent adoption of appropriate measures for the prevention of soil erosion and land quality deterioration. This spread of intensive agriculture is attributable in large part to agricultural price policies adopted by the Philippine government at the national level. In particular, corn producers enjoyed high effective protection rates from near zero in the late 1960s to above 70 percent in the early 1990s (Pagulayan 1998; David 2003), to more than 90 percent by the decade's end (Coxhead, Chapter 7 of this volume).

Accession to the World Trade Organization (WTO) has had a minimal impact on the protection accorded to corn producers. Since corn is grown very widely in uplands, increased protection has had a direct and negative environmental impact. This is also true of vegetables, the other major seasonal crop grown mainly in uplands. Direct import bans have long been applied to some crops (potato, garlic, and cabbage), and raised their domestic prices far above international prices (Coxhead 1997). Like corn, vegetables are now among the most highly protected commodities in the entire Philippine economy (David 2003). These policy trends and, in particular, the persistence of high rates of protection for upland crops, translate into additional demands for upland land by farmers, and in turn into additional pressure on water resources (Coxhead, Chapter 7).

Local government and community support

Involvement of local communities and institutions is critical in the watershed-based approach to water resource management. Local stakeholders

can define more relevant solutions that take into account their unique social, economic, and environmental conditions and values. In addition, local stakeholder participation is important, as it creates a sense of ownership of identified problems and solutions, thus ensuring the community's active and sustainable involvement in water management plans. Rola, Deutsch, Orprecio, and Sumbalan in Chapter 8 show the critical role of people's initiatives at the local level. In particular, the chapter illustrates that in Lantapan, Bukidnon, the community is capable of managing its environment and natural resources even if doing so requires some level of technical expertise. In this case, the community, through a volunteer group, known locally as "Tigbantay Wahig" or water watchers, was trained in water quality monitoring and interpreting the findings. The experience of Lantapan demonstrates that local people with sufficient training can monitor their own natural resources. The authors thus suggest the institutionalization of the link between the water watch group and the environmental and natural resources office of the local government. This may be similarly followed in other local settings to institutionalize and sustain local efforts in the management of their natural resources.

Salas in Chapter 9 also illustrates how various members of the community could be involved in watershed management initiatives, as experienced in the Maasin watershed case in Iloilo province. The discussion shows clearly that when the local folks fully appreciate the link of watershed management to water supply, it becomes quite easy to get them involved in the protection of the watershed. The importance of information, education, and communication campaign is critical in bringing about this high level of appreciation.

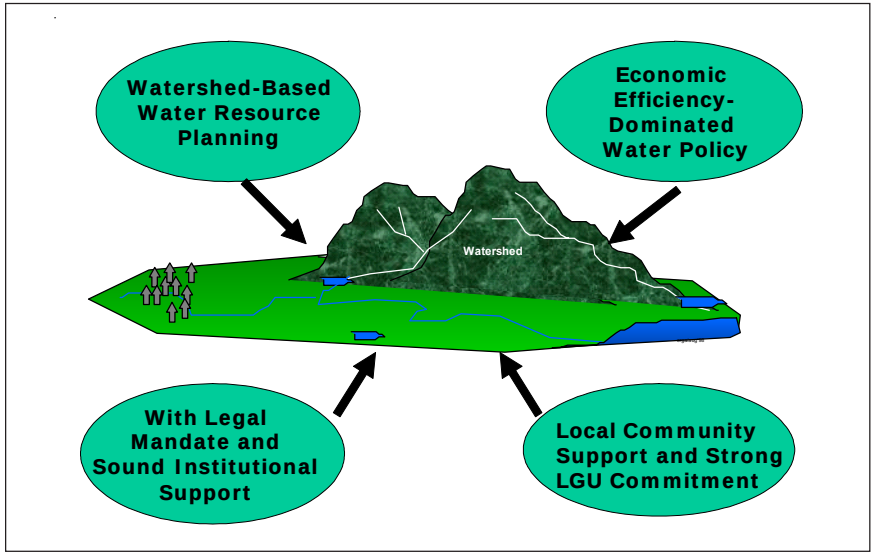
The author also emphasizes the need to discuss the watershed approach in relation to various social issues such as health and nutrition, and quality of life so that the link of other facets in life to the watershed maybe better appreciated. This is illustrated by the author in the case of the multisectoral, multistakeholder structure set up to manage and protect Iloilo's various watersheds.

A proposed watershed-based water resource management framework for the Philippines

The various chapters of the book have given us potential elements of a watershed-based water resource management framework in the Philip-

pines. Figure 5 depicts these elements as follows: a) a biophysical framework resulting from a watershed-based water resource management strategy; b) a legal-institutional framework that provides the legal basis and supporting institutions to implement the proposed water resource management strategy; c) an economic framework that is led by economic efficiency consideration; and d) a sociopolitical framework defined by the need to have wide support from local communities and political/government units. These elements are deemed critical in addressing the basic water resource problems, namely, water scarcity and degradation. The following sections further sum up the points discussed in the various chapters of the book and show how to proceed in implementing the proposed watershed-based water resource management framework.

Figure 5. Water resource management strategy



Watershed-based water resource planning

The watershed approach is the application of an integrated watershed management in the planning and implementation of water resources management. Integrated watershed management is the formulation and implementation of a course of actions involving natural and human resources in a watershed to achieve a specific social objective (Dixon and Easter 1986).

This model of a viable water resource management strategy takes into account the watershed as the primary unit of water resource planning, just as a barangay is the primary administrative unit in the Philippines. Watershed approach has a strong biophysical and economic logic, as discussed earlier.

The current paradigm in water management policy in the Philippines leans toward a river basin approach. This paradigm is actually consistent with the watershed approach except that the river basin as a planning unit is too big to be manageable. For better manageability, what is needed is to define a watershed unit that a given group of administrative units could co-manage as proposed by Francisco (Chapter 2 of this volume). The need for a legal and institutional framework to support this coalition of administrative units belonging to a watershed is thus an important element, as described in the next section.

Legal and institutional framework

Various authors in this book stress the need for an institutional body that will govern the watershed unit for its water resources and other environmental services. Since the watershed transcends administrative units, the need to have a watershed council or authority seems to be a move in the right direction to bring about a truly watershed-based water resource planning and implementation. This major step requires legislative support. Such a legal mandate must define who should have the power and how power and accountability must be shared among the various entities with interest in water-resource concerns. It should also clearly define how water must be shared among recognized users and what priorities must be established across uses. A legal system of this nature must include a discussion of the institutional requirements and accepted procedures for determining new uses, reviewing existing uses, and resolving disputes on water access (UNESCAP 2000).

Unfortunately, the lack of a comprehensive legal framework and unclear institutional responsibilities remain outstanding issues in the management of water resources in most developing countries. An institutional framework through which all water users will understand their roles thus needs to be developed. In addition, the core water allocation function will have to be defined, potential conflicts of interests identified, and measures to minimize such conflicts within institutions, formulated.

The Philippine Water Code defines the legal framework for the extraction, allocation, and management of water resources in the country. However, the government body that is supposed to implement the provisions of the Code needs major institutional reforms to make it more effective. This was one of the objectives of the master plan study conducted by the JICA/NWRB (1998). This book contends further that such a reform should be undertaken by defining the watershed unit as the basic planning unit for the reasons discussed by Francisco in Chapter 2.

Economic efficiency-dominated water policy

The economic efficiency consideration requires that situations be created to allow water to flow where its value is highest. These situations include the provision for charging the full water price and clearly defining property rights to water use/access. This book argues that there is considerable scope to increase the efficiency of water use by introducing market-based instruments. Examples of said instruments are water charges, water markets, and imposing effluent charges. These instruments could play an important role in stimulating an efficient use of water in the country (David and Inocencio 1996; Asad et al. 1999; UNESCAP 2000).

The book, however, recognizes the role of government interventions in ensuring social equity and addressing environment concerns. It also underscores the need for such efforts to ensure that those who need water the most—the poor—get the most benefit from programs designed to assist them. It also calls for the payment of compensation to those who provide environmental services (e.g., watershed protection) by those who benefit from these services.

Local community support and strong local government commitment

Another major issue in the proposed framework is the need to obtain broad support from the local community and concerned civil societies to ensure quality water management. Local communities are the frontline consumers of environmental "good and bad," resulting from either water resource rehabilitation or degradation. As such, it is in their best interest to be directly involved in the management of this resource. Their involvement in fact can spell the difference between the success and failure of these water resource management efforts. They should therefore be made

partners in such an endeavor and must receive training to enhance their capacity to perform their role (Deutsch et al. 2001 and Rola et al. in Chapter 8).

As in many parts of the developing world, the involvement of communities and (increasingly) of representative local governments is emerging as a critical factor in the success of environmental initiatives.

Local governments also play a major role in water resource management. Key to the success of the required local governance structures are (a) the support of water users; (b) the LGUs' responsiveness to local conditions; (c) the availability of information databases (rather than theoretically better but unavailable information); and (d) the adaptability to the evolving environment (Dinar et al. n.d.). In the Philippines, local governments are empowered to manage natural resources within their spheres of influence and are in a position to make residents comply with best practices in water resource management.

Conclusion: the next steps

This book seeks innovative ways of trying to win the "water war" or of dealing with water scarcity and its related concerns. In this regard, the authors of the various chapters discuss some of the more practical ways to deal with the water resource management strategy, beginning with planning down to implementation. While several levels of planning are proposed in the literature, this book conveys the idea that the watershed could serve as the unit of planning. The reason for this is twofold: a) to internalize the externalities; and b) to be consistent with the decentralization paradigm. Hence, much of the message in this volume lies in the promotion of the watershed as a fundamental unit in water resource management initiatives.

As in most developing economies, the challenge to the country is to "get the water law right" and "get the water prices right" (IWMI 2002). In the Philippines, where the laws on water are numerous, the problem lies in implementing them in a "society with many stakeholders operating in an informal sector and with little or no link to resource governance structures." The high transaction costs of monitoring water use and collecting water charges from vast numbers of small-scale users is a critical issue.

A crucial issue to address is the lack of an effective supporting and coordinating set of institutional arrangements that will reinforce the call for watershed-based water resource planning and implementation. This issue must be recognized and immediately addressed .

Once the legal basis for this watershed-unit mode of water resource planning and management is in place, all the other necessary elements (e.g., wide support from the local communities and the local government units, economic efficiency-driven water allocation and pricing policies, and institutional arrangements supportive of this unit) could be developed to build the pillars that will enforce the framework. Admittedly, obtaining results from this effort will take time. Nevertheless, the challenge must be tackled head-on.

Where do we go from here in terms of the legal water policy agenda? Contreras, in the epilogue, argues that legislation at the national level is needed to set up a central regulatory body. Alternatively, the NWRB, which is planned to be transferred to the DENR's jurisdiction, could also be strengthened and given more funds to pursue its mandate. At the local level, LGUs can establish water councils or watershed authorities and this may not require legislative action. Contreras strongly reminds decisionmakers that there should be "legislative restraint as well as legislative activism in the form of legislative economy and reform." He then stresses the need to establish a legal environment that allows advocacy initiatives to happen at the local level.

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Watershed-based water management strategy: why push for it?

Herminia A. Francisco

Introduction

One of the conclusions reached during the 1992 United Nations Conference on Environment and Development was the need to manage water resources more effectively in the future as its scarcity and misuse puts human health and welfare, food security, economic development, and ecosystems at risk (Stringer 1997). With this recognition comes the growing interest in water issues, both at the international, national, and local levels. The discussions focus on water scarcity and how this may be addressed—given competing demands for such a resource—and the challenge posed by sustainable development pursuits. Evidences show that competing uses by various sectors such as agriculture, industry, and domestic on limited water supplies have already constrained development activities in a number of countries.

In 1997, more than 1.1 billion people in low- and middle-income countries did not have access to safe water supplies and more people suffered from poor sanitation. This year, it is estimated that 166 million people in 18 countries suffer from water scarcity, with another 270 million in 11 countries having "water stresses" conditions (World Bank 2002).

This water situation is not expected to improve unless efforts, both on the supply- and demand-side managements, are exerted. On the supply side, efforts have always been focused on engineering solutions to improve access to water, largely in terms of investment in water infrastructure. This kind of solution implicitly assumes that water supply is limitless and all that is necessary is to make it more accessible to users. This assumption has long been challenged, since many of the natural resource

systems that support water supply have already been degraded while others remain under serious threat. There is now a growing recognition that water infrastructure, providing water for whatever uses, must be supplemented by efforts to repair and/or protect the ecosystems that support them. Such an ecosystem is that of a watershed.

This chapter focuses on the supply-side solutions to the water situation/problem which, in this case, refer to a discussion about watershed concerns. The discussion of the demand-side initiatives is contained in Chapter 6 of this volume.

Watershed as a planning unit in water resource management

Watershed, also called catchment, refers to an area that supplies water by surface or subsurface flow to a given drainage system, be it a stream, river, or lake. As such, the watershed is viewed both as water supply and distribution systems with finite water resource made available to various users for primary production, domestic and industrial consumption, transportation, or power generation. In addition, the watershed also provides important ecological functions that are significant at national and global levels.

The country's watershed resources

The country's total watershed resources are estimated to be 21 million hectares of land, representing 70 percent of the country's land area. Of the total, 75 percent (15.88 million hectares) are forestlands (Tesoro 1999). Of the forestlands, only 5.40 million hectares are covered with forest vegetation. This forest vegetation plays an important role in the capture, storage, and transport of precipitation that falls in the watershed. Any alteration in land uses within the forestlands will affect water quality and flow through the reduction of the filtering process and increased runoff of water and sediment (Waterlines 2001).

In 1995, the total number of watershed forest reserves was 117 with an aggregate area of 1.368 million hectares (6.5 percent of the total watershed area). The Department of Environment and Natural Resources (DENR) has identified 18 of the 85 critical watersheds listed by the National Irrigation Administration (NIA) as needing immediate rehabilitation. Among these are the Magat, Abulog-Apayao, Angat, Pantabangan, Jaluar, Maasin, Salug, Muleta-Manupali, Andanan, Allah, and the Buluan-Alip watersheds (Paragas et al. 1997). Further, some 0.685 million hect-

ares of watersheds are under the management of the National Power Corporation (NPC), Philippine National Oil Company (PNOC), and the NIA.

In addition to water, numerous forest products are derived from watersheds. These include timber, forage, fuelwood, agrisilvicultural crops, rattan, wildlife, and other minor forest/plant products. The watershed also provides services or amenities such as scenic views, aesthetics, and other form of recreational activities. A wide diversity of flora and fauna are also found in most watersheds. A forested watershed provides numerous ecological functions such as carbon sequestration and nutrient cycling function, among others.

The presence of these multiple goods and services makes the country's forest watersheds attractive to human encroachment, both to commercial loggers and smallholder farmers. Unregulated removal of forest cover and land conversion bring about watershed degradation, a situation that is considered as severe and widespread in the Philippines (Kummer 1992). The situation manifests in soil erosion, which is often cited as the worst environmental problem in the Philippines. Total annual soil loss from the Philippines each year has been estimated to be around 74.5 million tons by the DENR (1990) and 80.6 million tons by Francisco (1994).

Why a watershed approach?

A major justification for undertaking land-based resource management and water resource development using the watershed approach is the ecological linkage between the upstream land uses and downstream water conditions. In particular, land use transformations in upstream areas have an impact on downstream communities, directly or indirectly, through the effects on productivity and other conditions of lowland ecosystems.

The exact nature of the upstream land use and downstream water conditions relationship depends on many factors, with the scale of the watershed being an important consideration. Based on experiences presented during the Land-Water Linkages in Rural Watersheds Electronic Workshop (FAO 2000),[1] it was noted that for small watersheds, the rela-

[1] The same workshop opined that meso watersheds measuring 100 to 500 square kilometers and belonging to well-defined jurisdiction within the state or nation appear to be the optimal size for management purposes. Another general rule to follow is that the "watersheds should be of sufficient size to achieve economies of scale, take advantage of local government and technical expertise, and be viable for long-term management" (EPA 1997).

tionship between land use and water conditions is easier to establish with impacts of human activities easily identifiable. In medium-sized watersheds, there is already some difficulty in isolating the impacts of natural forces from anthropogenic causes, but for large watersheds, natural forces like landslides and strong rains seem to be the dominant causes of sedimentation. The large watersheds (sometimes referred to as river basins as shown in Box 1 of Chapter 1), therefore, are generally more difficult to manage and hence pose serious challenges to watershed managers. Regardless of scale, however, efforts must be exerted to ensure that watershed management activities are appropriate or well targeted.

Taking the watershed as the planning unit would thus make it possible for planners to analyze the various sources of water pollutants in water bodies, where the watershed drains. With more information, planners can establish a hierarchy of pollution sources as well as identify their contributions to water quality conditions, thereby making targeting efforts to address the problem easier.

On the administrative side, the Philippine government has separate agencies dealing with water resources, water quality, watershed resources, irrigation, energy/hydropower, domestic water supply, and other water–related concerns. More critically, the DENR and the National Water Resources Board (NWRB), which are the major players in watershed planning, belong to different agencies (although the NWRB is planned to be eventually transferred to the DENR). Hence, coordination of activities on issues that affect each other is not easy, especially since the agencies represent different groups with competing demands for water. With the eventual transfer, however, of the NWRB to the DENR, coordination is expected to be better streamlined and easier. And since the watershed allows one to look at the interrelationships of the various activities connected to this ecosystem, then the watershed unit seems to be the relevant planning unit for water resources management.

This chapter's call for the use of the watershed as the relevant planning unit in managing the water resource base is not new. The Philippine government, through its environment department, has expressed commitment to this approach, but this has largely been limited to management of the land-based resources within the upper watershed. Since activities within watersheds eventually translate to impacts on the downstream water resources, then the same call can and should be made toward improving water resource management in the country.

Notwithstanding the environment department's tacit approval of this approach, its implementation is still very limited. This chapter reviews cases where the management unit is the watershed and identifies the key elements for its wider implementation. It also discusses the legal and institutional forms of support for watershed management in the country and proposes changes that could support watershed-based water resources planning in the country.

How watershed-based water management works: case studies

Watershed management means different things to different people. Oftentimes, though, it includes such measures as soil conservation, reforestation, assisted natural regeneration, agroforestry, and a whole range of activities that involve the communities within watersheds.

Whatever it means, the common element that pervades it is the need to integrate the biophysical aspects of watersheds with the socioeconomic dimension, since many of these watersheds are already inhabited and cultivated. Almost all discussions on the topic point to the need for watershed occupants (both from lowlands and uplands) to be involved in decisionmaking in ways that promote nondegrading land use practices. Adopting the watershed management approach requires a major organizational structural change that involves strong political support and corresponding budget allocation. It likewise calls for strong leadership to mobilize local support and commitment by relevant stakeholders.

The following cases illustrate some of the experiences in efforts to mobilize various stakeholders' support in watershed-based planning and management approach.

The Maasin watershed in Iloilo[2]

The Maasin watershed covering 6,738 hectares was declared a watershed reservation as early as 1923. It covers three municipalities, 16 barangays, and 80 sitios. It is a source of water to 500,000 residents of Iloilo City and about 2,000 households along the way. It provides irrigation water to 2,900 hectares belonging to 1,276 farmers. About 64 percent of the wa-

[2] Facts were taken from the paper presented by Maasin Mayor Mariano Malones in a water forum organized through a UNEP-funded project in Mt. Makiling Forest Reserve. In Chapter 9 of this book, Salas describes how the concern about and protection of the Maasin watershed led to the creation of a multisector body—the Iloilo Watershed Management Council—mandated to plan and manage key watersheds in the Iloilo province.

tershed is already open or cultivated. The loss of forest cover has resulted in the reduction of watershed resource potential of the area. As a consequence, only 35 percent of the household water requirements of Iloilo City could be met by the resource, with the remaining water requirements being sourced from Guimaras Island and nearby districts. There is also a shortage of irrigation water during the dry season, thus reducing cropping intensity in the area. Poor water quality and intermittent faucet flow from service pipes of the Metro Iloilo water district have also become evident. These situations have led to a strong clamor for watershed rehabilitation in the area.

The governor of Iloilo responded to the situation by making the rehabilitation of Maasin watershed a top priority of the province. To push this agenda, he created and chaired the Maasin multisectoral task force. The task force then asked the DENR to undertake a feasibility study of the planned Watershed Rehabilitation Project. At the same time, the task force launched a massive information, education and communication (IEC) campaign in print, radio, and television to generate public awareness and support to the watershed situation.

As a result of these efforts, the task force was able to raise funds as follows:

- P0.5 million donations from various groups of civil societies. The provincial government provided a counterpart fund of P0.5 million.
- DENR allocated the following funds from various sources:
  - Asian Development Bank fund of P1,778,450 for survey, mapping, and planning
  - OECF fund of P44,269,143 for community site development activities in 2,685 hectares and P4,833,000 for community organizing, and P2,610,635 for monitoring and evaluation
  - National government provided P9,473,936 for the rehabilitation of 1,070 hectares and P2,479,000 for community organizing
  - OECF loan of P1,884,294 covering 100 hectares and P41,000 for the establishment of 20,000 square meters of vegetative strips
- Metro Iloilo Water District contributed P1 million for watershed protection activities.

- The National Economic and Development Authority also allocated P3.7 million for the construction of 2,850 cubic meters of structural measures (GABION) and provided P1.4 million for the conduct of three research studies. It also provided P573,000 for the establishment of 53,900 square meters of vegetative measures.

The communities are active partners in these massive watershed rehabilitation projects. The organized ones were contracted to undertake comprehensive site development with full funding for various activities such as reforestation, assisted natural regeneration, timber stand improvement, agroforestry, rattan and bamboo enhancement, among others. Technical assistance was provided by the DENR with an organization helping in community organizing and managerial preparation of the peoples' organizations.

The ample resources[3] allocated to the project over the past few years have generated significant accomplishments, in both physical and social terms, as summarized in Box 1.

Given these accomplishments, the remaining concern is how these gains can be sustained beyond the project's life. The local government units (LGUs) concerned realized that sustained IEC activities and successful livelihood activities were critical in maintaining the commitment of the local populace to watershed protection efforts. It also realized that reliance on external funding was not sustainable; hence the need to find ways for the self-generation of funds.

In 1999, the Ford Foundation funded the "Watersheds' Learning Communities"—a project that lasted until 2001. This project adopted an IEC and networking approach to mobilizing community participation in environmental protection projects within the watershed. The project supported various activities such as the school-on-air "Ugat Sang Tubig" that was introduced in 1998. It also helped form 70 barangay information centers (BICs) that were subsequently institutionalized in the LGUs. The BICs serve as catalysts for community actions to benefit the environment

[3] The *Kahublagan Sang Panimalay Foundation,* Inc (2001) terms it "investment overkill."

Box 1. Summary of major accomplishments in the Maasin watershed

- Community organizing (CO) works with 16 people organizations (POs) organized into a federation
- Completion of socioeconomic baseline surveys in upland communities
- Assistance provided to POs which were contracted to do site development
- Conduct of a series of IECs
- Conduct of numerous training for team building, leadership, preparation of feasibility studies, etc.
- Inclusion of security embodied in the community-based forest management agreement that allows 25 years of stewardship, renewable for another 25 years
- Assistance to POs in the establishment of 17 livelihood projects
- Utilization of the OECF loan, as of December 1999, in the forms of reforestation (1,050 hectares); agroforestry (749 out of 884 hectares targeted); bamboo (249 hectares) and riverbank stabilization (60 hectares), and rattan (94 of the 111 hectares targeted)
- Government of the Philippines (GOP) funding for the following: riverbank rehabilitation of 270 hectares, agroforestry development in 300 hectares, assisted natural regeneration (ANR) in 300 hectares; and vegetative measures in 20,000 square meters
- Provision of protective infrastructure: 85-kilometer trails; 700 meter-fire lines; 77 units of nursery; 7 lookout towers; 14 Gabion; and 6 units of concrete dam.

in various forms of "people's initiatives." In these people's initiatives, the role of the youth, children, and women was stressed.

The IEC activities created high awareness among the relevant populace on the water supply problem and how it was linked to land uses in the upper watersheds. The project also succeeded in mobilizing voluntarism toward watershed protection, for which the role of the assisting organization was pivotal.

The project also facilitated the creation of the Iloilo Watershed Management Council through a provincial ordinance (see Chapter 9). This social infrastructure was very important in sustaining and operationalizing the watershed approach, having legitimized the political support to watershed management efforts in the area.

The Local Government Code (Box 2) provides the legal basis for the local government of Maasin to gain control over this watershed. The

Box 2. Legal basis for the collection of Maasin's share of the water district's revenue (Republic Act 7160 or the Local Government Code of 1991)

Section 289. Local government units shall have an equitable share in the proceeds derived from the utilization and development of national wealth within their respective areas, including sharing the same with inhabitants by way of direct benefits."

Article 386 (b). The term Natural Wealth shall mean all natural resources situated within the Philippine Territorial jurisdiction including lands of public domain, waters, minerals, coal, petroleum, oils, potential energy forces, gas, and oil deposits, forest products, wildlife, flora and fauna, fishery and aquatic resources, and all quarry products.

Section 291. Share of the local government from any government agency or government-owned and -controlled corporation engaged in the utilization and development of national wealth based on the following formula, whichever, will produce a higher share for the LGU:

- One percent of the gross sales or receipts from the preceding calendar year; or
- 40 percent of mining taxes, realties, forestry and fishery charges, and such other taxes, fees or charges, including related surcharge interest of fines the government agency or owned or controlled corporation would have paid if it were not otherwise exempt.

Section 293. Remittances of the share of LGU. The share of the LGU from the utilization and development of national wealth shall be remitted in accordance with section 286 of this Code. Provided, however, that in the case of any government agency or government-owned or -controlled corporation engaged in the utilization and development of the national wealth, such shall be directly remitted to the provincial, cities, municipal, or barangay treasurer concerned within five days—after the end of each quarter.

local government then succeeded in convincing the court to require the Metro Iloilo Water District to pay them 1 percent of its gross revenue, as mandated by law. The amount collected was intended for the protection of the Maasin Watershed and other development projects in the area.

The US experience[4]

The United States of America has long adopted the use of the watershed as the logical planning unit in dealing with wastewater management[5] through its Clean Water Act.[6] This Act requires all states to develop and implement Statewide Watershed Frameworks that will integrate water quality management initiatives of local, state, and federal partners. The US also has the Clean Water Action Plan under the Environmental Protection Agency (EPA) and the US Department of Agriculture (DA) that serves as the blueprint for restoring the nation's water resources. The Plan identifies the "four tools for clean water": a) watershed approach, b) strong federal and state standards, c) natural resource stewardship, and d) informed citizens and officials.

Documents reviewed for this chapter emphasize that "watershed-based water quality management and protection" is the most effective approach to addressing national water quality concerns. The EPA (1997) notes, "The watershed approach has changed the way that the US EPA and other federal, tribal, and state agencies are managing water resources program." This approach requires the active involvement of local governments and the local populace. To support this mandate, the US EPA has created the Watershed Academy, which is responsible for providing technical watershed information, either through live training, published materials, or the Internet. The Academy disseminates relevant information regularly through its Information Transfer Series. As a result, there is now a clear local understanding of how a watershed functions and how land uses and management affect water quality. Primers that put forward this relationship are continuously being made available to the citizenry and are being taught as part of the watershed education program.

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[4] The Pacific Northwest has many experiences on watershed initiatives. It has numerous watershed groups or associations that were formed by citizens to address water quality problems. Some of the locations where said associations have been active are in Coeur d'Alene Lake, Henrys Fork, Lake Sammamish, Nisqually River, and Tillamook Bay. There are also State and Federal watershed initiatives in Washington State, Oregon, Idaho, and Alaska (EPA 1997).

[5] This concept was recognized as early as the 1890s based on the work of the Inland Waterways Commission. At that time and until the first half of the century, the focus was on efficient use of water resources for multiple uses. The emphasis shifted in the 1960s to improving ambient water quality and protecting the country's drinking water.

[6] The 1965 Water Quality Act led to the formation of River Basin compacts for Delaware and Colorado. At that time, basin plans had been developed to classify water bodies according to their best uses.

The various watershed units also adopt an effective extension delivery system that is accessible to stakeholders in the watershed. The extension program is instrumental in promoting voluntary adoption and sustained application of best management practices. The program targets the youths through high school education so that long-term social change could be realized.

The case of Cauca River watershed in Colombia

In 1959, the *Corporacion Autonoma Regional Del Valle Cauca* (CVC) in Colombia was created to manage the Cauca River watershed following the Tennessee Valley Authority Model (Echavarria 2000). The mandate of the CVC is to manage the upper part of the watershed. Given a sporadic water flow, the CVC distributes rights for surface water, giving priority to domestic use, through a permitting system. The fee charged is $0.50 per liter per second, with payment done every trisemester; payment per permit is mandated in spite of nonutilization of full permitted amount to ensure that the cost of maintaining the program can be raised.

With water scarcity rising in the late 1980s, particularly during summer months, causing production to decline, the agricultural land users formed themselves into an Association of Water Users. Farmers receiving water from the same water source, or sub-basin, constitute one association. The water users' associations have volunteered to pay an additional fee on top of what the CVC collects—as payment for watershed protection and management fee. The fee ranges from $1.50 to $2 per liter per second per trisemester. The associations work closely with the CVC and oftentimes decide on what activities (e.g., reforestation, livelihood activities, training of community members, soil erosion control measures, purchase of land for soil conservation, etc.) they will undertake and finance in their respective watersheds. The number of associations has grown to 12 over the years, servicing more than a million hectares of forestland and some 97,000 families.

Lessons learned from the three case studies

Several critical factors are crucial to widespread planning at the watershed level.

Foremost of these is a clearcut legislative action, similar to the Clean Water Act of the US that mandates explicitly that water pollution should

be addressed with the watershed as the basic planning unit. This need, though recognized, is not explicit in the Water Code of the Philippines (Presidential Decree 1607). What is needed is a stronger political commitment to the development of a more systematic approach to improving water resource management in the country. This commitment has to be made explicit in the law.

The case of the Maasin watershed points to the critical elements of effective watershed management. It demonstrates that while funding is an important component of such an undertaking, by itself it is not enough. Strong LGU support is the pivotal element to this reality. This support was institutionalized through provincial legislation, the creation of the Iloilo Watershed Management Council, and the BICs, all of which are vital to sustaining the efforts initiated, mostly with external funding, for watershed management.

The League of Municipalities in the Philippines has expressed support to the watershed approach by coming up with a resolution during the First National Conference on Watershed Management held in Davao City in 2001. This provides an opening to push for this approach on a wider scale, since LGUs have expressed appreciation of the merit of watershed management planning.

The conduct of an IEC campaign and the strong support of an assisting organization are also vital elements of watershed management—for it is only when the stakeholders themselves fully appreciate this approach that a more sustained support can be realized. Having an institution similar to the Watershed Academy in the US is one way to promote this approach on a bigger scale and on a sustained basis. A center created solely for this purpose is needed in view of the existence of so many watersheds in the country and numerous concerns relating to the implementation of the said approach. Through this center, the LGUs, along with representatives from the various agencies and other stakeholders, will learn how to manage water and natural resources, with the watershed as the planning unit.

Surely, the situations are expected to be far more difficult in a developing country, where legitimate and illegal occupants have already encroached on many of the country's watersheds. It may take years to put the system in place, but one has to start somewhere somehow. Initial efforts may thus be done through existing universities like the University

of the Philippines in Los Baños, which have the expertise to provide such training.

Admittedly, one must invest in substantial data collection and monitoring activities, but the stakeholders' involvement, particularly the local communities, in the long run should make the system manageable. Information is particularly critical in establishing downstream-upstream linkages, particularly in large watersheds. Where the watershed is small enough, this effort may not be that difficult, since impacts are easier to trace to their causes.[7] For large watersheds (or river basins), this is often not possible. Assistance for gathering information, bringing parties together, and enforcement are often necessary. Fortunately, the Local Government Code provides the legal basis for the collection of environmental service payments and their use in watershed protection and management.

The case studies also show various ways to generate funds for watershed protection and management. To obtain broader support for the collection of environmental service payments, however, one needs to have strong political support, as was demonstrated in Costa Rica, where an agency was created specifically to handle environmental service payments, fully supported by legislation and with corresponding budget allocations.

Since the importance of the legal basis for watershed management was exemplified in the cases analyzed, a detailed discussion follows.

Legal and institutional support for watershed management

The Philippine Constitution mandates the proper utilization and conservation of natural resources. The revised Forestry Code of the Philippines (PD 705) stipulates the government ownership, control, regulation, and management of some 419 large watersheds whose combined area roughly equals 70 percent of the total land area of the country (Forestry Master Plan 1990). With the exception of few areas earmarked for geothermal explorations, the administration, control, and management of the country's watersheds are entrusted to the DENR. The specific policies that support

[7] This was demonstrated in the case of Zamboanga in Southern Philippines, where, after eight years of community-based management activities in the uplands, substantial reduction in sedimentation of downstream coastal areas was noted. As a result, the fish farmers' association volunteered to sell fish at discounted prices to members of the upland farmers' association responsible for watershed protection.

watershed management as the logical approach in managing natural resources in the country are listed in Box 3.

After reviewing the various watershed-related policies in the country, Javier (1997) concluded that there is yet no clearcut and comprehensive watershed management policy in the Philippines. This conclusion was based on the observation that regulations pertaining to watershed management were scattered in several policy issuances and administrative orders of the government. He saw the need to integrate these various provisions in a single and distinct policy pronouncement. He stressed, however, that there were still unresolved issues that could threaten watershed management approach, as follows:

- Conflicting land uses and practices within watershed areas.
- Inappropriate land classification and disposition of watershed areas—of which a significant portion are classified as alienable and disposable (A and D) lands. The presence of A and D lands makes it difficult for government to implement watershed development projects and activities.
- Continued encroachment and illegal occupancy.
- Lack of economic incentives for watershed management and protection.

Tesoro (1999) reaffirms the lack of a national comprehensive policy and strategy for sustainable watershed management in the country. He also notes that while there are some watersheds in the country with management plans, they are more of the exception rather than the rule, as most watersheds have not yet been subjected to management planning. Partly, he believes that the problem stems from the inability of the DENR to manage the large area of watershed resources of the country due to inadequate manpower and technical skills. Nonetheless, several watershed management projects are underway, as discussed by Acosta in the Annex to this chapter.

As far as water resources are concerned, the law clearly states that all waters belong to the State (Section 2, Article XII of the 1987 Philippine Constitution). The Water Code of the Philippines (PD 1607) is the basic water law of the Philippines. The Constitution also specifies that the utilization, exploitation, development, conservation, and protection of water resources shall be subject to the control and regulation of the Government

Box 3. Major watershed management policies

- **Revised Forestry Code (PD 705)** governs the management and utilization of the country's forest lands, including watersheds and reservations. It provides the definition of critical watersheds in relation to downstream infrastructure facilities and accords them protected status—this means prohibiting commercial logging, grazing operations. It also authorizes the President to proclaim portions of the public domain as watershed reservations to secure their protection and preservation. To date, there are 120 proclaimed watershed forest reserves with an aggregate area of about 1.4 million hectares.
- **LOI no 917 (1979**) declares critical watersheds and proclaimed watershed reservations as wilderness areas. As such, these areas cannot be subject to exploitation of whatever nature. This provision further highlights the protected status of critical watersheds and watershed reservations under PD 705.
- **Executive Order No. 192 (1987)** mandates the DENR as the primary government agency responsible for the management, conservation, and development of the country's forest lands, including but not limited to watershed areas. In the same year, some of the watershed areas were transferred to the National Power Corporation through EO 224 and to the Philippine National Oil Company (EO 223). LOI 1002 also placed portion of the Magat River Forest Reserve under NIA.
- **National Integrated Protected Areas System Act (RA 7586)** includes, among other areas, proclaimed watershed forest reserves.
- **The Water Crisis Act of 1995 (RA 8041)** underscores the importance of watershed management. It directs government to adopt urgent and effective measures to address national water crisis. As mandated by RA 8041, a Joint Executive-Legislative Water Crisis commission was created. In its resolution dated January 1996, the Commission approved and adopted the Guidelines for the Identification and Prioritization of Watershed Areas where Adverse Developmental Undertakings are to be suspended. Likewise, as an offshoot of RA 8041, the President created the Presidential Task Force on Water Resources Development and Management through EO 374, dated October 15 1996. Headed by the DENR Secretary, the task force is mandated to oversee and coordinate the adoption and implementation of policies and programs on water resources management and development.

Source: Javier 1997

through the National Water Resources Council (PD 424 of 1974)—subsequently renamed National Water Resources Board (through Executive Order No. 124-A). It did not specify, however, that water resource management should be carried out using the watershed approach. This appears to be a major limitation of the Water Code of the Philippines.

The legal mandates of the NWRB to collect and impose fees and charges for water resources are derived from various legislation. Article 83 of the Water Code of the Philippines, for instance, authorizes the Board to impose and collect reasonable charges for water resources development from water appropriators (Villenas 2000).

The NWRB is also authorized to revise water charges to account for the following: intended use of water, quantity/rate of withdrawal vis-à-vis other uses taking into account the water-bearing potential of the source, environmental effects; extent to which water withdrawal will affect the source; and development cost of bringing water from the source.

This list of charges is supposed to help protect the source of water. Yet, from observations, the charges do not seem to consider the real source of water—upstream. Instead, they are more concerned with permitting the system for water extraction and water appropriation to various uses. There is thus very limited coordination with the DENR whose mandate covers the water source as well as the environment. This situation needs to be rectified if a truly comprehensive water resource management is to be achieved.

Link with other government agencies

According to Tesoro (1999), one of the problems relating to the weak implementation of the watershed approach is the proliferation of agencies responsible for watershed management and the absence of efforts to consolidate their activities and programs. Specifically, he notes, that while the DENR is responsible for the biophysical components of the watershed, the NWRB remains responsible for the granting of withdrawal rights to water on these watersheds. A Presidential Task Force on Water Resources Development and Management was also created, but it has limited authority and was largely an oversight body tasked to ensure the efficient sourcing and use of water resources. Without appropriate resources to carry out its task and an unclear legal authority for the job vis-à-vis the other agencies, this Task Force did not last long.

In addition to the DENR, the other agencies which exercise control over specific watershed areas of the country are the NIA, NPC, and PNOC. They particularly control those watersheds that support irrigation and power infrastructure projects. The DENR, for its part, has entered into agreements with the Local Water Utilities Administration on the co-management of certain watersheds that support infrastructure of local water districts. Furthermore, the DENR, through Administrative Order no. 32-92 which implements the provisions of the Local Government Code, has devolved to the LGUs control over what it called "small" watersheds. Guidelines, however, are needed to determine what may be classified as "small' watersheds for effective devolution of responsibility over these watersheds.

The presence of these different agencies, each exercising control over some watersheds, led to the fragmentation of responsibilities and duplication of functions over some watersheds. The specific roles and functions of these agencies need to be reviewed alongside those of the DENR.

The need to have an interagency council or authority is increasingly being felt by these agencies. The now-defunct task force mentioned earlier could have addressed this need. It lacked, however, the legal mandate and appropriate budget allocation to effect a truly working interagency collaboration. Thus, it did not last long.

A similar agency must be organized, this time with a stronger mandate to fulfill its role. Corresponding directives should also be given to the various agencies concerned so that they can align their programs with the watershed planning activities. The time to do so is now, given the increasing problems with water supply in terms of quantity and quality.

Link with local governments and community involvement

Managing the country's natural resources is simply too much for the DENR alone. The watershed management section of the Forest Management Bureau (FMB) that is under its jurisdiction sorely lacks the needed institutional capabilities, operating budget, and manpower and physical resources to carry out this mandate.

The DENR has adopted various strategies to improve its capacity to meet the demand for its services. It has embarked on the Community Forestry Program (CFP) to involve local communities in the task. Through

the CFP, the communities are awarded security of tenure over many watershed areas for up to 50 years. The Local Government Code of 1991 authorizes the DENR to involve LGUs in the management of natural resources in their areas of jurisdiction. The Code furthermore provides the legal basis for the sharing of income earned from the extraction of natural resources in their respective watersheds.

LGUs can impose extraction fees for access to and use of watershed resources, as is currently practiced in Palawan. They can also prescribe the "best agricultural land use practices" to farmers in upland areas, similar to what one barangay in Claveria, Misamis Oriental is doing. In that barangay, a resolution was passed to require upland cultivators to adopt soil conservation measures. Those who will not comply will not be given a barangay clearance, which is needed in contracting marriages, employment, and passport application, among others. The LGUs across all levels in Sarangani province are also involved in charting the course of resource extraction in that province. The local officials' strong commitment to protect the area's natural resources has been instrumental in the success of such efforts.

The foregoing measures point to the key role that LGUs and the community can play in protecting the country's watersheds. Many LGUs, however, remain uninvolved in resource management. Perhaps more efforts are needed to inform and educate them on the need for the watershed approach.

On a positive note, the birth of the Philippine Watershed Management Coalition[8] in 1997 was a significant development in the country. Through this coalition, a number of watershed management councils have been formed in the country, mostly spearheaded by the LGUs. In March 2001, the Coalition sponsored the First National Conference on Watershed Management, attended by the League of Municipalities of the Philippines in Davao City. The conference resulted in the adoption of a resolution mandating LGUs to prioritize/allocate funds for watershed management and institutionalize watershed management bodies/councils in local government units.

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[8] This is an organization formed by graduates of Ford-sponsored training courses. It is more of a nongovernment agency but members come from various sectors, mainly LGUs and the DENR and has been very active in promoting watershed management approach in the country.

Legislative reforms on water resources management

Congress has filed several bills (House Bill 9970, HB 1109, and HB 199) calling for a comprehensive water resources management in the country. House Bill 9970 provides for the protection and conservation of the country's watersheds and the creation of the Water Resources Authority. If this bill will be passed into law, managing water resources using the watershed approach will finally become mandatory.

House Bill 1109 calls for the formation of watershed or basin authorities—with the same power as the Laguna Lake Development Authority. The authorities shall manage water resources at the watershed or basin level under a national framework for water resources management. The authority is expected to develop the water resources management plan for its watershed/basin, which shall employ participatory and community-based local decisionmaking. More importantly, the authority is expected to approve all water resources development plans, programs, and projects that affect water supply and its appropriation and be responsible for monitoring water quality and quantity within its jurisdiction.

It may also be noteworthy to mention that in the recently held National Water Forum sponsored, among others, by the NWRB, the principle of an integrated water resources management was recommended. One of the elements in this management approach is the river basin or watershed framework and the formation of river basin or watershed authorities was likewise accordingly recommended.

The Philippine Clean Water Act seeks to address the high level of pollution found in many water resources in the country, particularly those coming from landbased sources. Unlike the two previous bills mentioned, however, this recently passed law does not specify the use of the watershed approach in solving the problem of water pollution. The watershed approach should be made more explicit in the Implementing Rules and Regulations of the Act.

The situations in Brazil and in the United States of America have shown that watershed management approach works well when there is supporting legislation that clearly mandates this approach.

Conclusion

The DENR recognizes the need to adopt the watershed as the relevant planning unit for the country's water resources. Yet, it has not fully adopted

this approach nor institutionalized it within the agency. For this to happen, the DENR must have a watershed management program with appropriate funding support from the national government. Such appropriation will boost the capacity of the DENR to undertake this responsibility.

As pointed out earlier in this chapter, the watershed approach is vital to water resource management. Hence, it should not be DENR's responsibility alone, because concern for water resources cuts across agencies. Thus, the need to integrate actions and programs relating to the sources of water and water quality conditions. Such actions and programs include those of the NWRB. Placing the NWRB under the DENR is therefore a welcome move.

The watershed approach, which rests largely on interagency collaboration on issues pertaining to water and on major stakeholder involvement and strong LGU leadership, is thus the main strategy to improve water resource management in the country. It will also help to set priorities for action on a systems basis, thus promoting cost-effective control policies and targeting of funds, as well as public participation and public-private partnerships. It is time to pursue this concept of using the watershed unit as the basic planning unit in water resource management on a bigger scale, with the involvement of all the agencies concerned.

Annex A
Assessment of the implementation of the watershed approach in natural resource management in the Philippines*

This Annex lists down a number of programs and projects that have been implemented in the environment and natural resources sector through the years. These programs and projects have different objectives but a common thread runs through them—rationalizing land and/or forest resources management while directly or indirectly addressing watershed and water resources concerns.

Below are their brief descriptions.

Multiple-use river basin management

The then Bureau of Forestry (subsequently, Bureau of Forest Development) implemented the multiple-use river basin management concept from the late '60s to '70s. Comprehensive multiple-use forest management plans were developed and implemented in the following major river basins: the Ambuklao-Binga River Basin, the Upper Pampanga River Basin, and the Upper Cagayan River Basin. Extensive training programs were conducted to develop multiple-use forest managers. The lessons learned and experiences gained went into the multiple-use management principle enunciated in the Revised Forestry Code (PD 705).

Regional Resources Management Project (RRMP) of the ENR-Sectoral Adjustment Program (1992-1999)

The objective of RRMP was to support the development of the institutional capabilities of LGUs and communities to plan, generate, and service small-scale community-based resource management and livelihood subprojects *in upper watershed areas*. It was implemented in 28 major watersheds in Luzon and Mindanao Islands. It followed a strategy to address upland poverty by empowering communities through improved local organization, enhancement of skill for natural resource management

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and sustainable upland agriculture, secure tenure arrangements and better access to financial resources for livelihood improvements.

Forestry Sector Program and the Forestry Sector Project (FSP)

The Forestry Sector Program, funded by the ADB and OECF, was implemented from 1988 to 1993. Under this program, open and denuded public lands were contracted out to families, communities, LGUs and corporations for reforestation. The Forestry Sector Project was likewise funded by ADB and the Japan Bank for International Cooperation. Its initial year of implementation was 1993 and ran until 2003. Under the project, discrete, community-based subprojects on reforestation and watershed rehabilitation were implemented.[9]

The Watershed Resources Development Project (WRDP)[10]

The WRDP is a World Bank-assisted project aimed at: a) formulating a policy and institutional framework for the water sector; b) formulating a national water resources management strategy that reflects the nation's social, economic and environmental objectives and is based on a proper assessment of the country's water resources; c) adopting a river basin approach, integrating land use policies and agricultural practices with water management; d) preparing catchment management plans to properly maintain and manage upstream watersheds for sustaining irrigation and other projects, assuring water quality and protecting aquatic ecosystems; and e) emphasizing decentralized management with participation of stakeholders for greater cost recovery.

The five components of WRDP are: a) Improved Water Resources Management (Water Resources Planning and Management Improvement), implemented by the National Water Resources Board; b) Catchment Management Improvement (Improved Watershed Management), implemented by the DENR; c) Improvement and Repair of National Irrigation Systems (Systems Improvement and Repair), implemented by NIA; d) Institutional Strengthening of NIA and Irrigation Associations, implemented by NIA;

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[9] Source: Forest Management Bureau.

[10] From Javier, J. *The Philippine strategy for improved watershed resources management: revisited.* Paper presented at the Fifth Multi-Sectoral Forum on Watershed Management, November 2001, House of Representatives, Quezon City.

and e) Environmental Improvement, implemented by the Department of Health.

Philippine Canada Environmental and Economic Management (PCEEM) Project

The PCEEM Project is based on an integrated ecosystem planning and management approach and broad participation methods. It will strengthen the capacity of both public and private sectors to develop and implement cooperative resource management and governance systems with emphasis on mechanisms for consensus-based planning and decisionmaking. It will involve the skills, expertise, and experience of NGO, government and economic sectors from Canada and the Philippines in a partnership drawing upon Canada's ample experience in *cooperative water basin management systems*.

The general objective of the project is to improve the management of the watershed ecosystem in Metro Cebu and Davao City. The project is designed to strengthen and enhance the capacity of Metro Cebu and Davao City to adopt innovative government, industry, and local community governance systems to address natural resource management problems affecting their respective watershed ecosystems.

Southern Philippines Irrigation Sector Project (SPISP)—Watershed Management Subcomponent

The SPISP is an Asian Development Bank-funded irrigation project in Regions VI, VII, and Caraga. Under its Environmental and Social Measures component is the Watershed Management Subcomponent. Watershed management activities are now being started in three core project sites: Can-Asujan Small River Irrigation Project in Carcar, Cebu; Calayagon Communal Irrigation System in Buenavista, Agusan del Norte; and Gibong National Irrigation System in Prosperidad, Agusan del Sur. Two noncore sites have also been identified: Magballo in Kabankalan, Negros Occidental and Logum-Baobo in Veruela, Agusan del Sur.

Natural Resources Management Program (NRMP I & II)

NRMP was a USAID-supported program; its goal was to assist DENR develop a policy environment conducive to ecologically sound and sustainable economic growth with special attention to tropical forests,

biodiversity and forest products industry. Under its Forest Resource Management Component, the following subcomponents were implemented: Community-Based Forest Management; Ancestral Domains Management; Policy Studies; Information, Education and Communication (IEC); and Training.

Under its Coastal Resources Management Component, the objective was to achieve sustainable management of coastal resources in sufficiently large areas of the Philippines in such a way that ongoing resource degradation in these areas are offset or reversed. The subcomponents were: Policy Implementation and Dialogue, IEC, Development of Learning Areas, Enterprise Development, Mangrove Management, and Training.

The EcoGovernance Program

EcoGovernance is a DENR program funded by USAID and implemented in collaboration with other partners (DA/BFAR, DILG, the Asia Foundation, LGUs, etc.). It aims to build and strengthen capabilities to improve local ecological/environmental governance and ensure a sustainable natural resource base for the benefit of communities in particular, and the nation in general.

The EcoGovernance program aims to improve: a) LGU capabilities to carry out good EcoGovernance; b) DENR's (and other national government agencies') capabilities to support LGU initiatives on EcoGovernance; and c) DENR and LGU capabilities to derive institutional support from regional/local service providers for EcoGovernance undertakings. These objectives shall be achieved through: a) policy analysis to support policy reforms needed for good governance; b) capacity building for national government agencies, regional/local service providers and LGUs to carry out EcoGovernance; and c) advocacy and coalition building to build broad political support for EcoGovernance initiatives.

EcoGovernance is fully relevant to watershed and water resources concerns. It covers three major ecosystems: upland ecosystems (through the promotion of sustainable upland and forest development); urban ecosystems (through improved solid waste management); and coastal ecosystems. EcoGovernance supports activities that promote initiatives such as: reducing open access to coastal/forest resources and minimizing destructive practices; strengthening mechanisms to resolve natural resource use conflicts; increasing competitiveness of solid waste management services;

strengthening institutional ability to enforce environmental laws; and mobilizing civil society support for better environmental governance.

The Master Plan Study for Watershed Management in Upper Magat and Cagayan River Basins

This is a study being conducted with the support of the Japan International Cooperation Agency in Northeast Luzon. The study will lead to the development of a watershed management master plan for the Upper Magat and Cagayan River Basins.

The Community-Based Forest Management Strategy and Program (CBFM)[11]

The CBFM is the primary strategy for the sustainable management of the country's forest lands and resources. This is a major initiative to devolve the management of forest lands, resources, and watersheds to forest-dependent communities. The aim is to put about 9 million hectares of public forest lands under the stewardship of organized CBFM communities. The program presently covers about 5.4 million hectares, with about 1.8 million hectares comprising forest lands claimed as ancestral domains by indigenous peoples.

Implementation of the Model Forest Approach for Sustainable Forest Management in the Asia Pacific Region (Model Forest Project)[12]

The Model Forest Project is being implemented in the Ulot watershed in Samar Island. It is assisted by the Food and Agriculture Organization, with funding from Japan.

The project aims at the following: strengthening national policy framework for sustainable forest management; field-level model forests development; strengthening of capacities in relation to appropriate land and forest use practices (national and local levels); strengthening of capacities to facilitate or enhance information flow and communication of experiences and technologies (local, national, regional levels); facilitation of collaboration between agencies, stakeholders, and/or related programs;

[11] Source: Author's personal notes.
[12] Source: Forest Management Bureau.

and mobilization of resources (local, national, regional, and international levels) for implementation of the project and of model forests/sustainable forest management in general.

Land Administration and Management Project (LAMP)

The project is supported by the World Bank and Australian Agency for International Development. Its objectives are to test alternative approaches to accelerated land titling programs and to build a sound policy and institutional foundation for the implementation of a long-term land administration and management program. In the long term, the program seeks to: a) improve land tenure security (by issuance of conclusive land titles) for millions of Filipinos, the vast majority of whom are poor and cannot afford the existing expensive and complex procedures for titling and registration; b) help develop the formal land market which will ensure the efficient use of land, enable easier access to formal credit through the introduction of collateral lending; and c) facilitate the increase of revenue collections by the government.[13]

Devolution of watershed management to other agencies and entities

A few small watersheds have been devolved to LGUs concerned, while some larger watersheds are currently managed by agencies other than the DENR such as the NIA, NPC, PNOC, and individual water districts.[14]

The NPC has eight major watershed reservations under its jurisdiction by virtue of EO 224 (1987) (Cruz 2001). These are: Ambuklao-Binga Watershed Forest Reserve, Lower Agno Watershed Reservation (part covered by the San Roque Multi-Purpose Project), Angat Watershed Reservation, Caliraya-Lumot Watershed Reservation, Makiling-Banahaw Geothermal Reservation, Buhi-Barit Watershed Reservation, and Tiwi Geothermal Reservation.

PNOC has jurisdiction, control and management of watershed areas surrounding the following geothermal reservations: Tongonan Geother-

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[13] Source: DENR.

[14] See, for example, Fernandez-Boma A., *The Water Districts' Strategies for Improved Watershed Resources,* presented at the Fifth Multi-Sectoral Forum on Watershed Management, November 2001, House of Representatives, Quezon City.

mal Reservation, Palimpinon Geothermal Reservation, and Bacon-Manito Geothermal Reservation (Cruz 2001).

A small number of interagency river basin authorities/watershed management councils have also been established. A civil society national coalition exists—the Philippine Watershed Management Coalition—which advocates watershed education, discusses and responds to watershed issues, advocates responsive policies, and promotes participatory action research on watersheds (Salas 2001).

Assessment of implementation of the watershed approach

It is evident from the succession of programs, projects, and various initiatives at the national and local management levels that were listed above that there is a recognition by many sectors and governing entities of the need to address watershed and water concerns. In the ENR sector, this consciousness is reflected in the configuration of the policies, strategies, programs, and projects in different ecosystems: uplands and forests, urban, and coastal ecosystems.

Substantial work has been done, especially in the area of forest land use management, where the management of such upland resources directly impinges on watershed and water resources. This consciousness, however, is not sufficiently translated into effective conservation of land and watershed resources on the ground, as noted in the following major findings on policy instruments and the policy environment with respect to forest land uses and, consequently, to watersheds and water resources that various studies conducted for the development of the Watershed and Ecosystem Management Framework and the CBFM Strategy and Program (informally called Philippine Forest Policy 2001 or PFP 2001) have put together (DENR 2001):

- Low charges collected from forest resource users do not motivate them to become responsible and environmentally concerned users of the land and the resources therein. This is clearly illustrated by the poor performance of logging companies in the past.
- The importance of assessing the probable impacts of any policy, program, project, and land use on the total environment is still not fully appreciated even with the presence of fairly good policies on environmental impact assessment.

- For as long as the local communities do not have adequate opportunities to improve the quality of their lives, they will continue to engage in unsustainable and unprofitable production systems in the uplands if only to survive. Continuous marginalization of the local communities, such as what happened to those within the periphery of logging concession areas in the past, will not transform them into partners in the conservation of forest (and land and watershed) resources.
- Population growth will continue to increase the pressure to use the forestlands for nonforestry uses, including cultivation, residential, commercial, and industrial uses.
- Part of the problem in being unable to promote a more orderly and conservative use of forest lands is not only the absence of policies but the absence of effective monitoring system or, if there is any, the lack of political will to implement the monitoring system.
- The national agenda for sustainable development as embodied in the PA 21 remains to be partially and selectively adopted by the different government agencies. PA 21 is supposed to be an integrated national agenda that must be internalized and embraced by all sectors. Unfortunately, the general public perception is that the sustainability of the forests remains to be the sole concern and responsibility of the DENR. It is very rare to find in the agenda of other government agencies the protection and conservation of forest resources either as a primary or secondary concern.
- One of the reasons for the misuse/abuse of forest and other lands (including watersheds) in the country is the absence of a comprehensive national land use policy. This results in confusion, competition, conflicts, and inefficiency in the use of lands (and watershed resources). In the absence of the national land use policy, the different sectors are not guided on how they are supposed to use the limited lands of the country in relation to other sectors. This is strongly illustrated by the usually conflicting use of the uplands by the DENR, DA, and Department of Agrarian Reform.
- The Mining Act of 1997 states that all lands found with mineral deposits regardless of quantity and quality can be covered by an

FTAA and can be declared as mineral lands. This definition is too sweeping in that it can result in the conversion of vast tracts of forest lands (and vital watersheds) into mineral lands by virtue solely of the presence of mineral deposits. This will further compound the conflicts in land uses and claims that already exist making it even more difficult to promote the sustainability of forest lands.

- There are two imperfections in the devolution of watershed reservations to the NPC, PNOC, and NIA. The first is the devolution of certain portions of the watershed only. Usually, only the areas closest to the reservoirs or the power generating structures are devolved to these agencies. This leads to the confusion on who takes care of the areas outside the reservation but inside the watershed. Further, the exclusion of the adjoining upstream and downstream areas will leave the problems of these areas unattended and can potentially spread over to the reservations.

  Another related issue is the imperfect relationship between the DENR and the NPC, PNOC and NIA. While it is provided in most proclamations that the NPC, PNOC, and NIA will coordinate with the DENR, the provision on the retention of the regulatory functions of DENR sorely sticks out. It creates a wall that prevents the DENR from providing the technical support it can give to these other agencies. It also prevents the efficient use of the resources that are available for the management of the reservation and the adjoining areas.
- Proclaiming a watershed as "critical" or as a single-use reservation to protect the watershed against any form of exploitation is unrealistic and difficult to implement. The facts are clear that almost all watershed reservations and critical watersheds are in varying stages of progressive degradation due to the continuous uses of these watersheds for "illegal" or noncompatible purposes. This policy is difficult to implement because it is almost impossible to keep the people out of the watershed when there are no alternative places they can go to. In addition, the existing capability to implement this policy is not adequate.
- Land use planning in the Philippines continues to suffer from the absence of sufficient and up-to-date database such as thematic maps and sociodemographic information that are essential in mak-

ing decisions during planning, implementation, and monitoring. This is aggravated by the absence of an information system that facilitates the availability and prompt acquisition of the forest resource information.

- Despite the provisions calling for the active participation of local communities and other stakeholders, most of the forest land use plans are still prepared largely by professional planners; the planning guidelines are still prescribed from the national agencies. Usually stakeholders' participation is limited to consultations, which do not necessarily result in consensus.
- Most of the land use plans in the past were prepared using planning units that were delineated following political (administrative) boundaries set by certain programs or projects. Such land use planning approach does not facilitate a thorough assessment of the interrelations of one area to the adjacent areas. This often leads to a land use and management plan that does not promote synchrony and complementation of development efforts within topologically related areas. Using the watershed as the planning unit enables the planners to understand clearly the interrelations of the upstream and downstream areas as well as the interconnectivity between ecosystems.

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A model of water governance in the Philippines*

Ben S. Malayang III

Introduction

Water governance refers to the collection of institutional controls on human conduct relating to water.[1] Rogers (2002) defines it as "the range of political, social, economic, and administrative systems that are in place to allocate, develop and manage water resources and the delivery of water services at different levels of society." It is about how society develops shared decisions and actions over water to ensure its continuing supply

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[1] Most literature on water governance focus on understanding three issues relating to water: (1) what it is as a resource; (2) how society shapes the manner it is managed and used; and (3) how to harmonize opposing and contrasting perceptions and uses of water resources. Chikozho (2002) refers to water resources as a commons and cites how water reforms in Southern Africa (Malawi, South Africa, and Zimbabwe) have been much influenced by changing global governance paradigms and theories on sustaining the availability of water, its equitable allocation and distribution, decentralizing and promoting participatory management, and integrating local and national decisions on water. He stresses how water governance in the context of a declining confidence in the State might be best approached through improving the power of different sectors to influence water access and use in all levels of social and State organizations. Dangbegnon (1996), too, refers to governing a lake resource in Benin as governance of a local commons. Drawing on the literature on common property (e.g., Ostrom 1990; Hanna et al. 1996), he discusses how water institutions in Lake Aheme have evolved through Benin's history (precolonial to postcolonial). He notes that even if traditional systems tend to survive across changing institutional landscapes, they move toward more complexity as new institutions are emplaced over others in time. Imperial and Hennessey (2000) look into more contemporary systems of watershed governance in the Delaware Inland Bays and suggest that its effectiveness largely depends upon how its "portfolio of actors and programs . . . work together more effectively." They say, "Watershed management is as much a problem of 'governance' involving multiple networks of organizations, as it is a question of science and designing effective policies."

and quality[2] and how human groups (as communities or societies) shape the state and conditions of water resources and their availability and services to the groups' members and users.[3]

This chapter presents a model of water governance in the Philippines that may serve as a framework for a systematic understanding of the complex dynamics of how water decisions and actions are shaped (or made) in the country. The model focuses on how decisions and actions are a result of a confluence of interests and powers of water users and institutions. The model was earlier developed out of Philippine experiences with forest management[4] and used here to explore how it may also be applicable to water.

Description of the model

Structure

The model is constructed from the following observations on how decisions and actions on water are made in the Philippines:

- There is a *multiplicity of institutions*—organizations and regulations—governing water and its uses in the country (Malayang 1999; Magallona and Malayang 2001);
- The authority and jurisdiction of water institutions differ in terms of a *hierarchy* of their coverage. Some are national (e.g., National Water Resources Board [NWRB], Bureau of Soils and Wa-

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[2] Water governance is a phenomenon across society, not individual acts. Ayudhaya and Ross (2000) talk of how water management in the Thai highlands improved only after villagers, government, and other stakeholders succeeded in evolving a shared vision of the watershed. Their conflicting visions hampered integration. Integration occurred only when visions shifted from conflicting to shared.

[3] Ahluwala (1998) looked into a community-based watershed project in India to determine why it failed in achieving its expected level of equity and sustainability. He cites local peoples' differential abilities to overcome the transaction costs of participating in the project as a constraint on their ability to invest in it. Where the dynamics are nebulous, the transaction costs can range widely. But formalizing and making more transparent and predictable the "covenant institutions" used to effect water governance may apparently overcome this. Allen and Schlager (2000) examined the water management of the Colorado River and suggest that covenants, as mechanisms "for establishing polities and crafting voluntary or enforceable obligations within political systems . . . offer a means for integrating heterogeneous actors politically by permitting asymmetrical rights and obligations when such structures make sense." They offer the tools that allow water users to "develop, modify, contest, and transfer their water rights." Bruns and Meinzen-Dick (1998) talk of "legal pluralism" as a possible option for stabilizing contesting claims to water rights, where "covenant systems" might include both statutory and customary systems of obligations and duties.

[4] The development of the model was done with funding from CIFOR's Adaptive Collaboration Management Project.

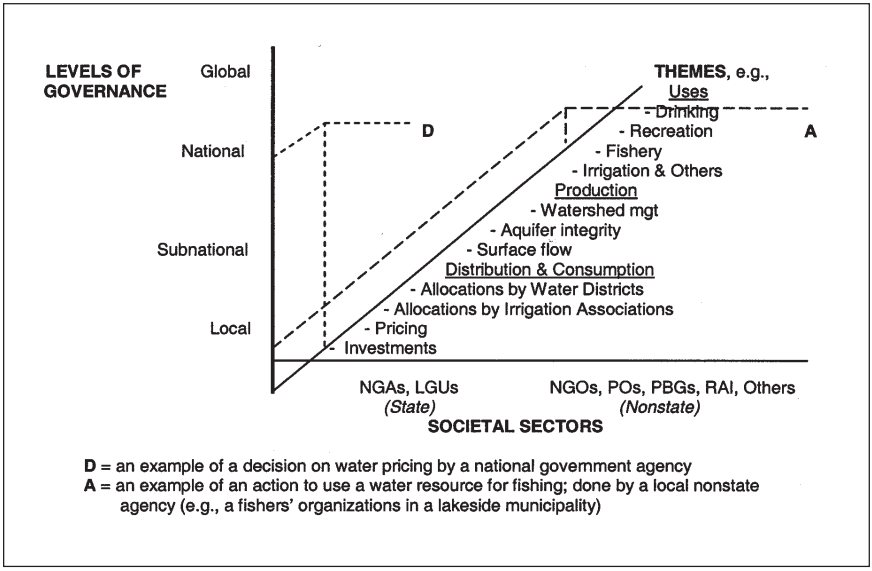
ter Management [BSWM], Department of Environment and Natural Resources [DENR]) while others are subnational and local (e.g., Metropolitan Waterworks and Sewerage System [MWSS], water districts). Others are global, which have acquired legal authority in the Philippines through treaty ratification. They, too, affect water decisions and actions in the country (e.g., the Ramsar Convention);

- The *mandates* of the institutions differ. Some are statutory (prescribed by law, e.g., MWSS, NWRB, BSWM, DENR, water districts) and others are customary (or are creations of tradition or local social arrangements, e.g., irrigation associations); and
- Water institutions differ in terms of the *sectors* they represent, that is, some are state agencies (e.g., NWRB, BSWM, DENR, MWSS) while others are community or civil society groups (i.e., nonstate organizations like irrigation associations, farmers' associations, consumer groups, nongovernment organizations [NGOs] and peoples' organizations [POs], private business groups [PBGs] and research and academic institutions [RAIs]). Some of the latter might have legal personality ascribed to it by the state such as farmers' associations given water rights under the Agriculture and Fisheries Modernization Act (AFMA), or NGOs and POs given official capacities in the national planning process like the Philippine Council for Sustainable Development (PCSD).

Thus, water decisions and actions in the Philippines are a product of the interplay of multiple institutions operating in different hierarchies of authority (multilevel), and from different sectoral perspectives (multisectoral) (see also Brillantes 1998 and Rood 1998). In addition, because concerns on water may conceivably include a number of issues over its uses and features, it is multithematic as well, that is, it covers a range of technical, social, economic, and political concerns on water. The three—hierarchy, sectors and themes—define a "governance space," where water decisions or actions occur, or which can be located at any given time (see Figure 1).

Water decisions and actions, however, are not events that occur by themselves. As with other resources (e.g., forests, lands), they are often the product of complex competition and collaboration among institutions

Figure 1. Three dimensions of water governance in the Philippines[a]

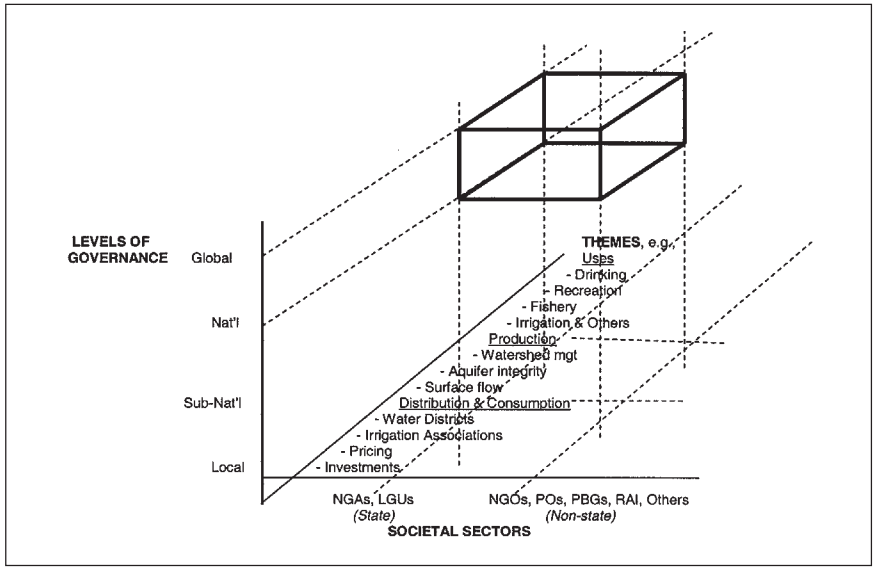


[a] Adopted from Magallona and Malayang 2001.

and their stakeholding constituencies in different hierarchies of governance (e.g., see Rogers 2002; Swyngedouw et al. 2002; Contreras 2001c; Buck et al. 2001; Coxhead and Buenavista 2001; Ellison 1998; Pertierra 1995; Grindle and Thomas 1991; Clarke 1998). Both institutions and their constituencies will either compete (which will most likely occur if their mandates overlap) or collaborate (if their mandates are complementary) to address one or more concerns about water. And while they may institute collaborative mechanisms to accommodate their different interests over various concerns, they will nonetheless seek to have their interests upheld eventually (e.g., see Buck et al. 2001; Contreras 2001c; Coxhead and Buenavista 2001; Ostrom 1999; Grainger et al. 1998; Grainger and Malayang 1998; Barbiers 1998; Clarke 1998; Bardham 1993; Grindle and Thomas 1991).

Thus, water decisions and actions are actually shaped by the dynamics of institutional competition and collaboration occurring within an *area* (not a point) in the governance space (Contreras 2001c; Malayang 1998; Grindle and Thomas 1991; Cobb and Elder 1972) as shown in Figure 2.

Figure 2. Decisions or actions occurring in an area in the three dimensional space of water governance in the Philippines[a]



[a] In this case, illustrating a decision or action made by government agencies and NGOs at global and national levels over the production, distribution and consumption of water.

Dynamics of power

Presumably, cooperation and competition are substrated by an institution's power to influence a water decision or action (see also Chikozho 2002 c.f. Alexander 1992). Power is an institution's ability to influence (even dominate) a decision or action. The decision or action gets based on what the institution (with power) prefers them to be. The greater the influence, the more powerful the institution.

Power is two-dimensional. First, it has *range*, or the extent that an institution can exert its influence on water decisions and actions across hierarchies, sectors, and themes. Second, it has *intensity,* the degree to which an institution's influence compares with those of others across hierarchies, sectors and themes. This suggests two cases on how power shapes water decisions and actions:

Case 1 (Relating to the power of an institution). Across the axis on *levels of governance* in Figure 2, the range of the power of a water institution can be in all or in only some levels, and it can be more intense in

some levels than in others (e.g., Figure 3a). It may range across all or only some sectors across the axis on *sectors*, and may be more intense over particular sectors than over others (e.g., Figure 3b). It may also extend over all or only some water concerns across the axis of *themes* and may be more intense over some concerns than over others (e.g., over irrigation or on controlling surface flow than, say, over distributing fishing rights or pollution control), as seen in Figure 3c.

Case 2 (Relating to the placement and concentrations of power). Water institutions operating in certain *levels of governance* may have more or less power to influence water decisions and actions than those operating in other levels (Figure 3a). Or the institutions in either the public or private sectors may have more or less power than others (Figure 3b). Or certain *themes* dominate (or are given less attention than others) in the exercise of their power (Figure 3c).

The first case focuses on the water institution itself and on the reach of its power. The second is about where power accumulates. In both instances, it is power that is relevant.

Each axis in Figure 2, therefore, may be assumed to be a *distribution* with corresponding limits of significance. Consequently, the inter-

Figure 3a. Possible configurations of the distribution and intensity of an institution's power to influence water decisions and actions across levels of water governance

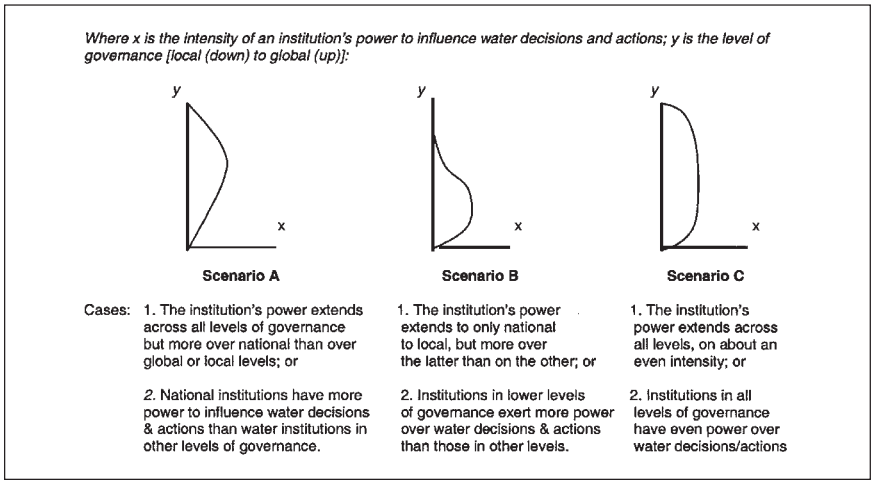
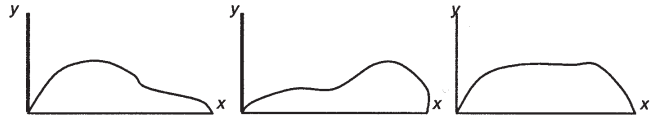


Figure 3b. Possible configurations of the distribution and intensity of a water institution's power to influence water decisions and actions across sectors

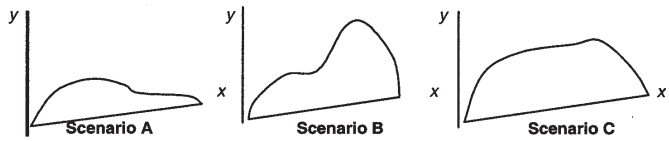
Where x are sectors that generate water decisions and actions [state left; non-state right]; y is intensity of a water institution's power to influence water decisions and actions:



	Scenario A	Scenario B	Scenario C
Cases:	1. The institution's power extends across all sectors, but more over state institutions than nonstate; or	1. The institution's power extends across all sectors but more over non-state institutions than state; or	1. The institution's power extends across all sectors, on about an even intensity; or
	2. The power to influence water decisions & actions is more among state institutions than non-state institutions	2. The power to influence water decisions & actions is more among non-state institutions than state	2. The power to influence water decisions & actions is about even across all sectors

Figure 3c. Possible configurations of the distribution and intensity of a water institution's power to influence water decisions and actions across different thematic concerns on water

Where x are thematic concerns of water decisions and actions (e.g., production or distribution) and y is the intensity of a water institution's power to influence the decisions and actions:

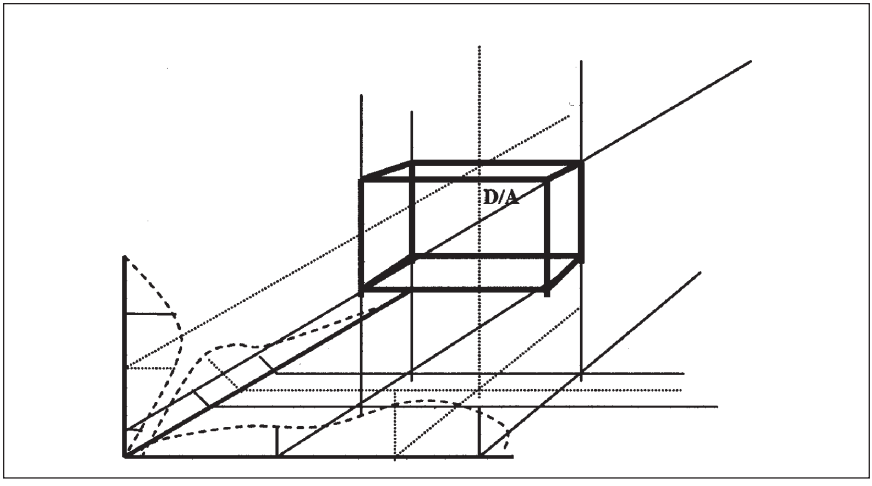


	Scenario A	Scenario B	Scenario C
Cases:	1. The institution's power extends across all concerns, but more on those in the left than in the right	1. The institution's power extends across all concerns, but more on those in the right than in the left	1. The institution's power extends across all concerns, on about an even intensity
	or	or	or
	2. Left-side concerns exert more influence on water decisions & actions than right-side concerns	2. Right side concerns exert more influence on water decisions & actions than left-side concerns	2. All concerns have about even influence on water decisions & actions

sections of transects of their upper and lower limits will form a solid that circumscribes the boundaries within which a water decision or action moves, presumably toward the intersection of transects of their respective maxima (i.e., toward where the most intense influences coincide; Figure

4). If a maxima in one-axis shifts (with or without a shift in limits), the decision or action may shift as well. That is, when: (a) either the reach of a water institution's power declines in some levels (Case 1), or the concentration of power shifts from one level (say, national) to another (say, local) (as in Case 2; e.g., when devolution occurs, see Figure 5a); or (b) either the power of certain water institutions operating in a level of governance increases with respect to other institutions in the same or other levels (Case 1), or the combination of sectors and institutions exerting the dominant influence on water decisions or actions expands to include other sectors or institutions (Case 2; e.g., when co-management occurs, see Figure 5b). The decisions and actions coinciding in the intersection of the maximas represent the confluence of the interests of the most influential institutions. To the extent that the decisions and actions set the parameters on (a) how water is to be defined as a resource, (b) how it is to be availed of, and (c) how it is to be used, they would constitute policy, at that time; that is, when the confluence of interests of the powerful institutions change (i.e., the maximas shift to form another intersect), the policy will change correspondingly.

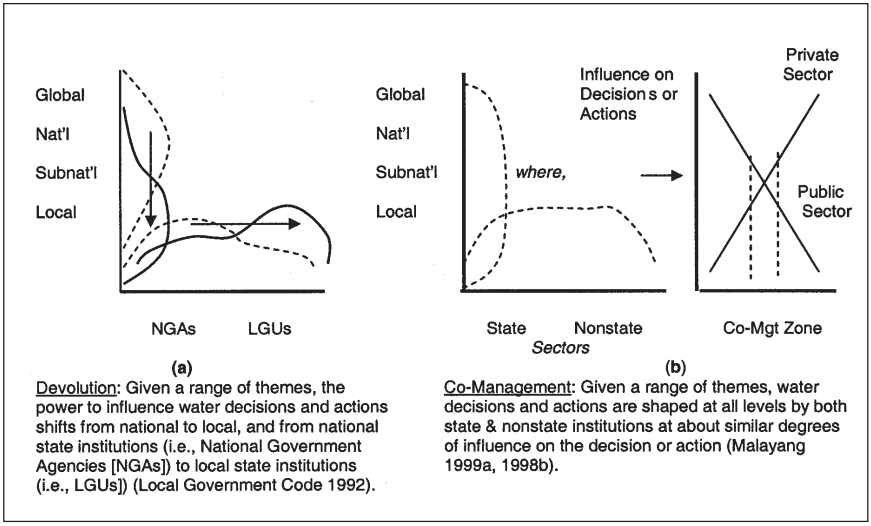
Figure 4. A solid formed by the intersection of transects of significance limits from three axes of governance showing the position of a decision (D) or action (A), as defined by the intersection of sample transects of maximal points in each axis



Thus, it may be held that the solid shown earlier in Figure 4 circumscribes a "policy space," where a policy **P** might move on a vector defined by the extent to which the institutional powers bearing an influence on **P** shift across sectors, levels, and themes. Or, given an axis v (v = sectors, levels of governance, and themes), where M_v, D_v, r_v and l_v are the maxima point, length of distribution, and right and left significance limits of the distribution of power in the axis, $\partial P/\partial \tau = f(\partial M_v/\partial D_v)$, $r_v \leq D_v < l_v$ for all v's. It follows that if the policy space is large, **P** will tend to be robust—or is less likely to change—because, presumably, it embodies a wide array of sectoral and institutional powers and concerns that converge on the policy. It has a wider power base and is anchored on a wide range of concerns about the resource, which, together, would combine to tend to keep it in its existing formulation.

In contrast, if the space is small, **P** is apt to be weak in that other institutions outside those now converging on **P** might muster a collective power that overwhelms those that agree on **P**. They may then put forward an alternative array of concerns or decisions and actions that could differ from **P**.

Figure 5. A graphical representation of the concepts of devolution (a) and co-management (b)



Devolution: Given a range of themes, the power to influence water decisions and actions shifts from national to local, and from national state institutions (i.e., National Government Agencies [NGAs]) to local state institutions (i.e., LGUs]) (Local Government Code 1992).

Co-Management: Given a range of themes, water decisions and actions are shaped at all levels by both state & nonstate institutions at about similar degrees of influence on the decision or action (Malayang 1999a, 1998b).

To the extent then that water policy (here defined as the complex of measures to make water available and useful to human communities) provides the basis for managing water resources, water management is fundamentally a construction of the interacting (competing, collaborating) array of influences (or the "ecology of power") of water institutions over the decisions and actions to develop, conserve, or utilize the resource.

Implications for water governance in the Philippines

The model suggests three propositions about water governance in the Philippines:

- *Water governance is a complex of institutional dynamics of power.* The power to influence water decisions and actions (which, to an institution, is largely derived from a combination of its mandate, resources, public recognizance of its legitimacy, and the scale of its constituency) lies at the heart of water governance. It is the *flux* of power across institutions (e.g., which among them are able to forward their preferred decisions or actions, and which are able to prevent others from doing so) that creates the dynamics, content, and direction of water governance.
- *Water policy and management are products of the confluence of interests of water institutions that have the most power to influence the decisions and actions over different concerns on water.* The location, flow, and thematic coverage of the concentration of power among water institutions (in the water governance space) determine the course and content of water policy and management. The larger the proportion of the influential institutions agreeing to a policy and a management scheme, to the total number of institutions comprising the institutional landscape of water governance, the more likely both the policy and the scheme will be stable and robust. The overall efficiency of the water governance complex will likely improve if the parity of water institutions to be able to influence water policy and management is high and wide across governance levels, sectors, and concerns (see also Murombedzi 1991; Abel and Blackie 1986; Seiderman 1992; Ostrom 1990; Bromley 1992; Hanna et al. 1996).
- *Different combinations of powerful water institutions will likely bring about different water policies and water resource manage-*

ment schemes. Each water institution may represent a different combination of stakes and concerns on water. When some of them converge on a common interest (or agreement) on water, the convergence will likely involve a specific range of concerns or preferences on what to do with it. The concerns and preferences will likely change if the combination of the institutions that have an influence over these concerns will change.

If the model is correct, it follows that it is the power of water institutions that will likely determine their ability to influence the shape, direction, and content of water policy and management in the Philippines. Their capacities to concede (to others) or advance (over others) their interests in the processes of institutional collaboration and competition to shape policy will depend on how much power they have in relation to others.

Handles of power

The power of a water institution is a creation of many things: its statutory mandate; its customary recognition; its human, technical, and financial competence; its political clout; its social standing and those of its leaders and staff; and the size or vastness of its constituency. Its ability (and willingness) to wield power is also a factor to an institution being recognized to be powerful. Most of these, however, are generally recognized as functions of an institution's legitimacy, public trust, and credibility (e.g., see Utting 2000; Brillantes 1998; Clarke 1998; Vitug 1994; Bromley 1992). These are the drivers that determine the degree to which an institution can muster public support for its decisions and actions over different concerns on water (or which allow it to acquire power).

Consequently, they offer the handles for controlling the content and direction of water governance (water policy and water management systems) by boosting or weakening the power of different combinations of water institutions such as:

- Where certain institutions that are at present in the margins of power are deemed to best benefit society by being more involved in shaping water policy and management, efforts may then be expended to improve their legitimacy, public trust, and credibility as institutions to make water decisions or take action on water.

(Corollary to this, if an institution is not now exerting an influence on water policy and management when, to many, they should, it must be because their legitimacy, public trust, and confidence as institutions to be involved in water decisions and actions are currently low.)

- Where certain institutions that are at present in the centers of power are deemed to best benefit society by being less dominant in shaping water policy and management, then the levels of legitimacy, public trust, and credibility of other institutions may need to be raised to match those of the dominant ones. In so doing, the influence on water policy and management will be widened and not dominated by a few.

  (Corollary to this, if there are only a few institutions now dominating water policy and management, it must be because the others that should be involved are suffering from a lack of legitimacy, public trust, and credibility as institutions.)
- If water policy and management were to be made more stable and robust, then efforts might be expended to elevate the levels of legitimacy, public trust, and credibility of as many water institutions as there are operating across the hierarchy, sectors, and themes of decisionmaking and actiontaking on water to widen the confluence of interests and agreements over water decisions and actions.

  (Corollary to this, if water policy and management were neither stable nor robust, it might be because there are no institutions in the country that have a clear ascendancy in legitimacy, public trust, and credibility to make decisions or take action on the nation's water resources.)

Power is the critical element on how water institutions can collaborate and agree over the decisions and actions that will constitute policy. And the keys to power—or to the ability of institutions to influence the content and direction of water policy and management—would be their legitimacy, public trust, and credibility (see also Imperial and Hennessey 2000).

The same three—legitimacy, public trust, and credibility—would be the keys to strengthening water governance in the country.

Illustrating the model: the case of the Pampanga River

The Pampanga River is a major surface water resource for both Pampanga and Bulacan provinces in Central Luzon. It supports smallscale freshwater fishery and industrial and domestic water needs in Pampanga. In the Bulacan downriver, it supports mainly domestic uses, smallscale catch fishery, and large aquaculture fisheries toward Hagonoy. It is also used for irrigation in both provinces.

The river's flow is irregular. Flooding can be severe at certain times of the year during typhoons and monsoons. It has from moderate to high loads of silt and its watersheds have low forest cover. Except in its upper reaches, it is polluted and is classified C open-water body by the government (DENR-EMB 1996).

Decisions on its use and what to do with it will need to somehow address how it is used in both Pampanga and Bulacan. Some of its uses in the two provinces may need to be controlled, and some expanded. In addition, measures like flood, siltation, and pollution controls would be needed to expand the river's usefulness to local communities and to its users.

These decisions and actions, which are local in nature, must, however, be consistent with how the Regional Development Council (RDC), the regional office of NWRB, and other LGUs and state agencies in the region decide on the use of the river for the region's overall welfare. To the extent that these bodies act as the subnational decision and action centers in the hierarchy of water decisionmaking or actiontaking in the Philippines, the decisions and actions in Pampanga and Bulacan shall be coordinated with, or subordinated to, the decisions and actions of the regional bodies. In turn, the decisions and actions of the regional bodies need to be coordinated with, or subordinated to, the decisions and actions of national, and even global, bodies regulating water resources in the country.

For instance, the measures to be applied to the river shall be within the parameters and water management set by the NWRB, the DENR, and the Department of Public Works and Highways (DPWH). If the measures

are not consistent with their stipulations and regulations, they could be illegal. Since it is a wetland, the measures shall be consistent with the provisions of the Ramsar Convention.[5]

The above illustrates how decisionmaking and actiontaking on an otherwise local water resource like the Pampanga River are actually a multilevel process, extending from local to global.

At the same time, the same decisions and actions involve not only state institutions but also nonstate sectors. At the local level, LGUs, industries, private aquaculture investors, smallscale individual fishers, and riparian communities constantly make decisions or take action that affect the river's life. At the regional and national levels, the decisions and actions of the RDC, regional state agencies, LGUs, NWRB, DENR, and the DPWH, routinely take into account (albeit in different degrees) public pressures from industry and civil society on how water resources must be protected and utilized. At the global level, the Ramsar Convention involves civil society and industries in crafting its provisions. Thus, the decisions and actions on the Pampanga River involve different sectors operating across the local to global hierarchy of water governance. It is multisectoral.

Finally, it is multithematic. If the Pampanga River were to be rehabilitated or improved, a number of concerns would need to be addressed together. Among them, flood control, pollution control, sedimentation control, watershed improvement, strengthening of regulations, and enforcement to control unwanted human behavior toward the river, and other concerns that may involve a host of engineering, environmental, social, and economic measures that need to be all done. The concerns are numerous and wide-ranging, but they all need to be addressed if the river were to be rehabilitated fully.

Today, the policy on Pampanga River is mixed and is therefore unclear on the whole. The more powerful institutional influences on its use and management tend to be the LGUs in the two provinces of Pampanga and Bulacan, and the national offices of the NWRB, DENR, and DPWH.[6]

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[5] This is an international environmental agreement ratified by the Philippines and is therefore part of the legal framework on freshwater management in the country.

[6] Somehow, in Central Luzon, the RDC and other regional bodies, including the regional offices of the NWRB, DENR and DPWH, have, by themselves, low influence on what to do with the Pampanga River. They are either restricted by mandate or by the absence of a capacity to take action (e.g., RDC), or they are highly dependent on what their national offices decide for them to do.

The first two have clear intentions on what to do with the river to expand their existing local uses of it. The latter three have equally clear intentions on the river, but more with respect to the wider regional and national interests on it. Neither LGUs nor national agencies have clear dominance over the other in terms of the power to enforce their intentions over the other; each one does what it can, leaving no visibly integrated system of governance of the river. This situation is likely to continue until one or the other institution overwhelms the others. If the impasse is broken, then the present nonclarity of the policy may shift to a situation in which the policy is likely to be that which the dominant institution will prefer.

This illustrates how water policies are shaped by the dynamics of power of water institutions.

Measures to address legitimacy, public trust, and credibility

Legitimacy and transparency

To address legitimacy, the core concern is to elevate the degree to which the public is made fully aware of what water institutions are doing. Assuming that they are in fact doing their best based on what their limited resources can allow, the one sure way of convincing the public that this is the case would be to keep it continuously informed of their efforts. It follows that transparency of public service would be a significant measure to be pursued toward this direction.

While mandate would be a prerequisite to legitimacy, public confidence in the water institution that it is in fact acting on its constituency's interest is still crucial. It may even be the final arbiter for how much legitimacy the institution can command from its constituency.

Transparency occurs when the constituencies of an institution are ensured of timely, accurate, and full information on what it is doing for them. They have a regular and real opportunity to correct or register either their support or opposition to what the institution does. Transparency creates the knowledge that, in turn, creates public confidence in the legitimacy of the institution.

Public trust and accountability

To address public trust, the core concern is to elevate public confidence in water institutions that when doing their mandates, they seek only to serve the public interest. They will not use water measures as cover for

graft and corruption, or realign public rents and assets for the benefit of only a preferred few. Consequently, strengthening the accountability of water institutions would be a key to improving public trust.

Public trust requires that the constituency of a water institution has full confidence that the institution is fully dedicated to promoting the former's welfare. It deploys its resources efficiently and judiciously, and only for the purpose of achieving its mandate. It can readily explain how it uses its resources toward achieving its mandate. It has a well-functioning command and control system, with clear lines and centers of authority and responsibility. It has a well-functioning check-and-balance mechanism with which the decisions and actions of any of its responsibility centers are constantly subject to oversight and correction. It has a clear procedure for due diligence and a system of standards and rules of conduct for its staff. It has a functioning system of rewards and sanctions for good and bad performance. It is certainly not corrupt, which it deems a direct opposition to public trust.

Credibility and participatory decisionmaking

To address credibility, the water institution's core concern is to ensure that its decisions and actions are technically and methods-wise solid and robust. They reflect a wide range of collective wisdom that emanates from the deliberations of a larger public than only its staff or officials.[7]

Credibility involves high public confidence that a water institution can effectively execute its mandate. When it does its job, the job will be done well. This is best ensured if there is a wide range of stakeholder participation in the processes when institutions make decisions or undertake actions. All stakeholders are represented and efforts are routinely undertaken to involve traditionally marginalized water users, e.g., women, indigenous people, the elderly, the youth, the poor, farmers, fishers, among

[7] Technical competence and "water wisdom" must be clearly distinguished. The first is a function of science and technology or of sound knowledge of water. The second is based on actual experience with water and its uses in different communities and social, political, economic, and environmental settings. Water institutions may have a large concentration of technical competence, but water wisdom is almost always procured only by deriving it from the sense of a larger public or constituency than are represented in the internal staffing of the institutions. In this sense, one measure to pursue to address credibility is to widen participation in the decisionmaking or actiontaking processes of water institutions.

others. Participatory decisionmaking and participatory action ensure a water institution's credibility in the long run.

Transparency is about a water institution's *mandate*. Accountability is about its *efficiency* when executing its mandate for the public good. Participation is about the *effectiveness* of the institution to achieve its mandate. All three are the basis for how much confidence the public has in a water institution so it will support its decisions and actions.

They are ultimately the basis for how much power an institution can muster to influence water policy and management in the country.

Summary and recommendations

Powers and collaboration among water institutions

The model suggests that water governance in the Philippines is a complex of powers of water institutions that concentrate on and flow across different levels, sectors, and concerns over water. It is a creation of an "ecology of power," which, in turn, constructs water policy and management systems.

The powers of water institutions—mainly emanating from out of their legitimacy, public trust, and credibility—are the consequences of their transparency, level of accountability, and breadth of participatory decisionmaking and actiontaking on water.

If an institution is less able to influence policy and management than it otherwise desires or is expected to, it may be because it has low levels of legitimacy, public trust, and credibility. If these were improved, they might lead to elevate the institution's capacity to influence water policy and management.

Or if an institution's influence is high and it becomes necessary to allow for a wider social and institutional base for policy and management, the transparency, accountability, and participatory processes of other institutions may be improved to allow them to gain as much power as the first.

The model stresses that *adaptive collaboration* among water institutions may be a potent mechanism for shaping water policy and management. That is, their ability to allow for each others' differences in capabilities, capacities, and water concerns in the interest of achieving a consensus on water decisions and actions, may strengthen policymaking and water management systems. But adaptive collaboration must occur widely

to provide for a solid substrate for water governance. Adaptive collaboration among water institutions leads to effective water governance.

Alternative configurations of water governance systems

The model suggests four alternative loci of water governance in the Philippines. These are centers of water decisions and actions from which would possibly emanate national water policy and management systems:

- *National government*. Water policy and management are as set by the state. The scope of policy and management are national and produced primarily as a decision of the government. Participation by other sectors and water institutions are as prescribed by pertinent national laws. Statutes are the basis of water policy and management. Oppositions are adjudicated by prosecution, litigation, or legal mechanisms for expressing dissent such as through the media.
- *National nongovernmental*. Water policy and management are as determined by powerful nonstate water institutions. The scope of policy and management is national and produced mainly as a decision of the nonstate stakeholders of water resources. Participation by other water sectors and institutions is as allowed by commonly recognized social arrangements, including the statutory rights of other stakeholders to water, like farmers' irrigation associations. National demand and stakes on the resource are the basis of policy. Oppositions are adjudicated by negotiations among stakeholders or, when these fail, by prosecution, litigation and legally allowed mechanisms for expressing opposition (e.g., through the media).
- *Local government*. Water policy and management are the decisions and actions of local governments on water resources within their jurisdictions. The scope of policy (policy here is viewed as the operational guidelines to govern water utilization) is local and primarily the decision of local government units. Participation by other water sectors and institutions is as allowed by local governments, mainly through legally prescribed procedures of participation. The interests and influence of local water users are the basis of the policy. Oppositions are adjudicated by negotiations and by legal procedures of prosecution and litigation. Legally

allowed mechanisms of dissent (like media) can be useful to compel negotiations and changes in water policy and management.

- *Local nongovernment*. Water policy and management are the products of how local users regulate the use of water. The scope of water policy and management is limited to a community of users and only to the extent that they are able to enforce them (mainly through customary mechanisms of compulsion). Participation by other water sectors and institutions is as allowed or accommodated by the users. The use and dependence of the local users of a water resource are the basis of the policy and its management. Oppositions are adjudicated mainly through negotiations even if sometimes, when negotiations fail, legal mechanisms may be resorted to by opposing stakeholders. Public pressures such as those through media may have little effect on the policy or management system.

Table 1 summarizes the features of these four loci of water governance. Each locus offers distinct strengths and weaknesses as options for generating water policy and management schemes. The national government option tends to be strong for its legal basis, and because of the coercive capabilities of the state to enforce government decisions. It can, however, be weak where its presence is low such as in the more remote countryside or where the reach of the bureaucracy is limited like in autonomous areas. It can be weak as well where its legitimacy is challenged by active dissent.

The national nongovernment option would be strong when its constituency were wide. It can command high moral and political legitimacy, which facilitates commitment to its decisions and actions. However, its weakness lies in its extreme dependence on consensus among its parties; when the compatibility of stakes among the parties break down, the consensus, and hence their decisions and actions, will be weakened.

The two options on local governance both offer potential strengths in that the decisions and actions they engender are anchored on local practices. These give them high policy and management legitimacy, which tends to give the two a good consensual anchor, and hence a higher level of robustness. The government option has the added strength of the backing of law while the nongovernment option has the added strength of a

Table 1. Summary features of four alternative loci of water governance in the Philippines

Loci of Water Governance	Producer of Water Policy	Scope of the Policy	Participation Opportunities	Basis of Policy	Resolution of Oppositions
National-Government	National Government Water Agencies	National	As prescribed by law	Statutes	Mainly through prosecution and litigation
National-Nongovernmental	National Nongovernmental Water Institutions	National	As allowed by social arrangements	National demand and stakes on water	Negotiations and litigation
Local-Government	LGUs	Local	As prescribed by law	Interests and influence of local users	Negotiations and litigation
Local-Nongovernmental	Local water users	Local	As allowed by social arrangements	Local dependence on and use of water	Mainly through negotiations

clearly defined constituency. However, the government option is highly tied to how government in general is viewed by local constituencies as legitimate articulators of local interests. Where this is low, this option is weak. The nongovernment option becomes weak when local water practices are not compatible with statutory prescriptions.

The model suggests, however, that the strengths of each option are enhanced and the weaknesses controlled if all four centers of water governance are able to produce a consensus on water policy and management. They are weakened whenever one or more centers are unable to concur with (more so oppose) the decisions and actions of the others.

If correct, the model implies that water policy, management, and governance in the Philippines would likely become more effective and efficient if they were to be the product of multisectoral participation in shaping the decisions and actions on water over a wide array of water

concerns. Participation is to be anchored on public transparency and accountability to engender higher levels of legitimacy, public trust, and credibility of water institutions, and thus of water governance itself.

Transparency, accountability, and participation are keys to strengthening water governance in the Philippines.

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4 Water resource governance: realities and challenges in the Philippines

Dulce D. Elazegui

Introduction

Water governance encompasses economic, administrative, and even political authority in managing water resources and services. As Malayang (Chapter 3, this volume) puts it, the level of governance pertains to the locus (i.e., national, regional or local, public or private), where the powers of institutions emanate. Multiple institutions exist at different levels of the government, each with its own mandate and jurisdiction in water decisions and actions. Because of crosscutting concerns on water use and management, however, these multiple institutions may either compete or collaborate according to their own interests.

Allocation of powers and functions and consensus-building among stakeholders determine the system of water governance. Decisions and actions would have to depend on the powers and influence of institutions and level of governance. Institutional powers lie on their legitimacy, public trust, and credibility. Thus the need to earn the confidence and support of their constituency to achieve consensus. The degree of collaboration among institutions also contributes to the attainment of coherent national and local water management goals (Malayang, Chapter 3, this volume).

In the Philippines, water management inevitably involves a two-tiered system of governance—national and local. In some instances, other sectors such as nongovernmental organizations (NGOs) also influence water policy and management schemes. The central government, though, still holds significant powers in water resource management. This is logical if there is a strong lead agency to orchestrate various efforts, and if local government units (LGUs) have varying or limited management capability.

However, when either the lead agency or local units face constraints in exercising their powers, some other governance strategy may be needed. For instance, a system that integrates different loci of powers may be more appropriate to achieve coherence and continuity in water governance. At present, there are policies in the country that recognize the importance of watershed protection and management. The problem, however, lies in their implementation, particularly at the local level, due to the absence or gaps and lapses in policies or mechanisms that explicitly address collaborative and integrative approach to water concerns.

On this perspective, this chapter examines the policies, roles and linkages of local and national institutions in water resource governance in the Philippines. It identifies issues emerging from the current institutional framework and cites local experiences. These pertain to interagency coordination from national to local levels, administrative and financial capability of LGUs, and the role of a central body to lead and coordinate water resource concerns. It also suggests policy and institutional reforms to address gaps and lapses in implementing water-related policies and to achieve coherent and more sustainable water resource management. The major reforms suggested are to have a watershed-based system of water management and effective local governance system anchored on local practices and interests.

Structure of water resource governance

Water resource governance in the Philippines is a responsibility of most national agencies in varying capacity. LGUs and local water districts also exercise certain powers but subject to national government decisions. NGO intervention has also been emerging. For example, the Philippine Watershed Management Coalition, which advocates the use of the watershed-based approach in water resource management, and the Philippine Water Partnership, among others, aim to gather various stakeholders to work toward an integrated water resource management strategy.

Box 1 provides a list of national and local government agencies tasked to protect watersheds and regulate water uses, as required by law. Figure 1 illustrates to some extent the delineation or overlaps in supply and demand functions of these institutions. The supply side concerns watershed management, watershed being a resource of multiple uses. The

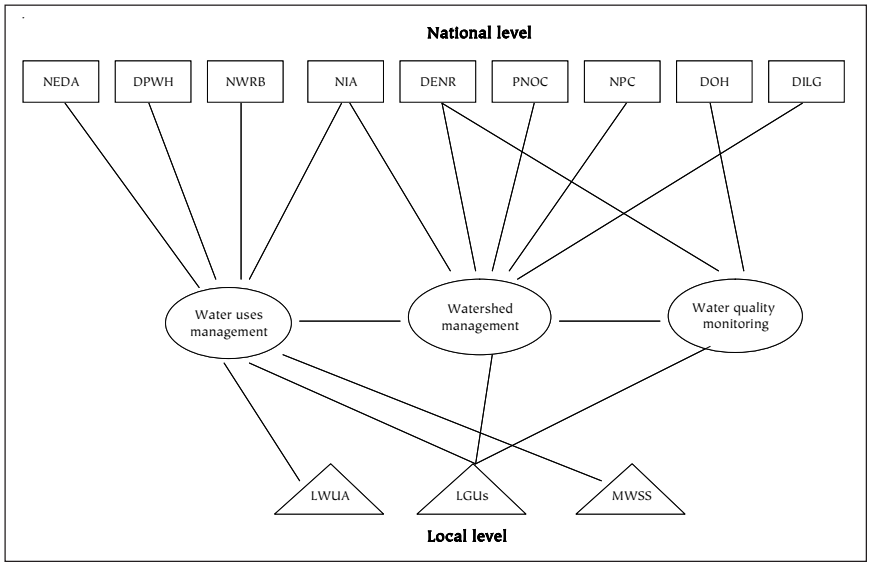
Box 1. Major government institutions governing water resources in the Philippines

Institution	Enabling Law	Mandate/Function
National		
Department of Environment and Natural Resources—Forest Management Bureau; Environmental Management Bureau	Executive Order No. 192 of 1987	To manage, conserve and develop forestlands and watersheds; and maintain water quality.
National Power Corporation	Republic Act No. 6395 (NPC Charter) EO 224 of 1987	To take water from any public stream, river, creek, lake, or waterfall for power generation. To exercise complete jurisdiction and control over watersheds surrounding the reservoirs of plants and/or projects.
Philippine National Oil Company	Executive Order No. 223 of 1997	To exercise jurisdiction, control, management, protection, development and rehabilitation of watershed reserves
National Irrigation Administration	R.A. No. 3601 of 1963	Improvement, construction and administration of all national irrigation systems in the country.
Department of Energy	Republic Act No. 7638 (DoE Act of 1992)	To allocate reforestation, watershed management, health and/or environment enhancement funds.
National Water Resources Board	Presidential Decree No. 1067 – Water Code of the Philippines of 1976	To coordinate and regulate water resource management and development, and water uses.
Joint Executive-Legislative Water Crisis Commission	Republic Act No. 8041 – National Water Crisis Act of 1995	To address the water crisis, including supply, distribution, finance, privatization of state-run water facilities, protection and conservation of watersheds and the waste and pilferage of water.
Department of Health	IRR of NEDA Board Res. No. 4 of 1994	To set quality standards for water testing, treatment, and surveillance and sanitary practices.
Department of Public Works and Highways	IRR of NEDA Board Res. No. 4 of 1994	To set technical standards for engineering surveys, design, and construction of Level I water systems.

Box 1 (cont'd.)

Institution	Enabling Law	Mandate/Function
National Economic and Development Authority	Executive Order 230 of 1987	To lead policymaking and infrastructure development and coordination of activities of various sectors.
National Commission on Indigenous People	Republic Act No. 8371 of 1997 (Indigenous People's Right Act)	To formulate and implement policies for the protection of indigenous peoples, e.g., ancestral domain in critical watersheds
Local		
Local Government Units	Republic Act No. 7160 – Local Government Code of 1991	To implement community-based forestry projects and management of communal forest with an area not exceeding 50 sq km, and enforcement of forestry laws, etc.
Local Water Utilities Administration	Presidential Decree No. 198 – Provincial Water Utilities Act of 1973	To own and operate water supply and distribution systems for domestic, industrial, municipal, and agricultural uses.
Metropolitan Waterworks and Sewerage System	Republic Act No. 6234	To assume responsibility for water supply in Metro Manila.

Figure 1. Major institutions involved in water resources governance



demand functions refer to regulating water utilization and monitoring water quality.

Overlaps in responsibilities, particularly among the national agencies, may be inevitable. What is crucial is how their efforts could be orchestrated and how collaboration would be harnessed. Clear linkage among national agencies, among local units, and between national and local units, is vital to resolving conflicts, particularly where demand for water is concerned. This may call for a lead institution to serve as a catalyst.

National level

In the Philippines, the Department of Environment and Natural Resources (DENR) and the National Water Resources Board (NWRB) are the major institutions that influence watershed and water-related decisions and actions. Watershed management is largely handled by DENR, particularly the Forest Management Bureau (FMB). The Environmental Management Bureau (EMB), also under DENR, is responsible for maintaining water quality in the country.

Based on certain proclamations, other government-owned and -controlled corporations (GOCCs), which source their water supply requirements from watersheds, also exercise complete jurisdiction and control over watersheds surrounding their plants and/or projects. These GOCCs include the National Power Corporation (NPC) for power generation, the Philippine National Oil Company (PNOC), and the National Irrigation Administration (NIA) for water supply to agriculture. The Local Government Code (LGC) of 1991 requires GOCCs involved in any project that may cause pollution and depletion of nonrenewable resources to consult with the LGUs concerned, and undertake measures that will prevent or minimize pollution and depletion of these resources.

The National Commission on Indigenous People (NCIP) under the Office of the President is also responsible for the implementation of the Indigenous People's Rights Act. The Act provides for ancestral domains or portions necessary for critical watersheds, protected areas, forest cover, or reforestation to be placed under the responsibility of indigenous people.

The Department of Energy (DOE) is also mandated to 1) devise ways to give direct benefits to regions and LGUs affected by power-generating facilities and projects, and 2) allocate reforestation, watershed management, health, and/or environment enhancement fund.

Meanwhile, the NWRB acts as the government coordinating and regulatory body for all water resource-related development. It is an interagency board that regulates water distribution, resolves issues and conflicts in water resources management and development such as inconsistencies in fees and charges. It also approves projects involving appropriation, utilization, exploitation, development, control, conservation and protection of the country's water resources.

The NWRB was transferred from the Department of Public Works and Highways (DPWH) to the Office of the President through Executive Order 123 of 2002. The NWRB will eventually be transferred to the DENR for closer coordination of water-related development concerns. It uses the 12 water resources regions, comprising 18 major river basins as units for comprehensive planning of water resources development. While it does not have regional or field offices, it is authorized to deputize any official or agency of the government to perform any of its specific functions or activities.

For water permit application, other agencies are also involved in issuing clearances or related documents (Box 2).

The Joint Executive-Legislative Water Crisis Commission is mandated to undertake nationwide consultations on the water crisis, in-depth and detailed review of the entire water supply and distribution structure; and to recommend remedial and legislative measures to address problems thereof. On policy initiatives in economic-environmental and natural resources accounting, the National Statistical and Coordination Board (NSCB) is the point agency.

Local level

Based on the LGC, the LGUs can also perform watershed management functions but are subject to DENR supervision and control. Provinces and municipalities implement community-based forestry management (CBFM), social forestry, and watershed projects but the barangays' role depends on the discretion of the LGU executives. While most of the country's river basins are under the supervision of the NWRB, two river basins have their own management entities, the Laguna Lake Development Authority (LLDA) and the Agno River Basin Development Commission.

Water delivery is carried out by water districts, quasi-public corporations that may serve one or more cities, municipalities, or provinces within a contiguous area. Formation of water districts is subject to the passage of a resolution in the concerned LGU. Water districts usually serve urban and peripheral semiurban areas. They govern drilling, operation and maintenance of wells within their territorial boundaries. In addition to the said functions, water districts are also responsible for the management, administration, operation and maintenance of all watersheds within their territorial jurisdiction. They could devolve their functions, including watershed management, to local government units if they opt to, per Presidential Decree (P.D.) No. 198.

Generally, in rural areas, LGUs operate their own water systems as the LGC also assigns them such function. However, this is usually subject to the capacity of LGUs to sustain waterworks, financially and technically.

The National Water Crisis Act of 1995 provides for the reorganization of the Metropolitan Waterworks and Sewerage System (MWSS) and

Box 2. Interagency collaboration in water use regulation

Required Document	Agency in Charge	Purpose of Water Use
Environmental Compliance Certificate or Certificate of Exemption	Department of Environment and Natural Resources	All water permit applications except for domestic purposes
Certificate of Registration with Articles of Incorporation (for corporation or association)	Security Exchange Commission	All water permit applications
Initial permit (as per R.A. 7156)	Department of Energy	Power purposes
Physical and chemical analysis of water	Department of Health	Recreation/commercial purposes
Clearance (if within the watershed of Laguna Lake)	Laguna Lake Development Authority	Fisheries and industrial purposes
Certificate of registration of business name for sole-proprietorship application	Department of Trade and Industry)	Industrial purposes
Certificate of conformance (for water districts)	Local Water Utilities Administration	Domestic purposes
Certificate of registration (if a Barangay Waterworks Association)	Barangay unit	Domestic purposes
Clearance (if reuse of wastewater for human consumption)	Department of Health	Domestic purposes
Clearance from affected deputized agent	National Irrigation Association, Metropolitan Waterworks and Sewerage System, Department of Public Works and Highways, Water District, National Power Corporation	

Source: Dayrit 2000

the Local Water Utilities Administration (LWUA) for effective and innovative operations to address water crisis. Based on P.D. 198, LWUA governs local water districts in municipalities and cities, and reviews rates or charges established by local water utilities. However, said rates and charges do not consider the cost of conserving a watershed as a major source of water. MWSS is LWUA's counterpart in the National Capital Region.

The water quality monitoring function, meanwhile, is at the discretion of the water districts and LGUs. The DENR-EMB sets water quality standards. For drinking water, the Department of Health (DOH) adopts the National Drinking Water Standards. With DOH devolved, though, its monitoring function becomes a responsibility of the LGUs, subject to the availability of funds and their priorities.

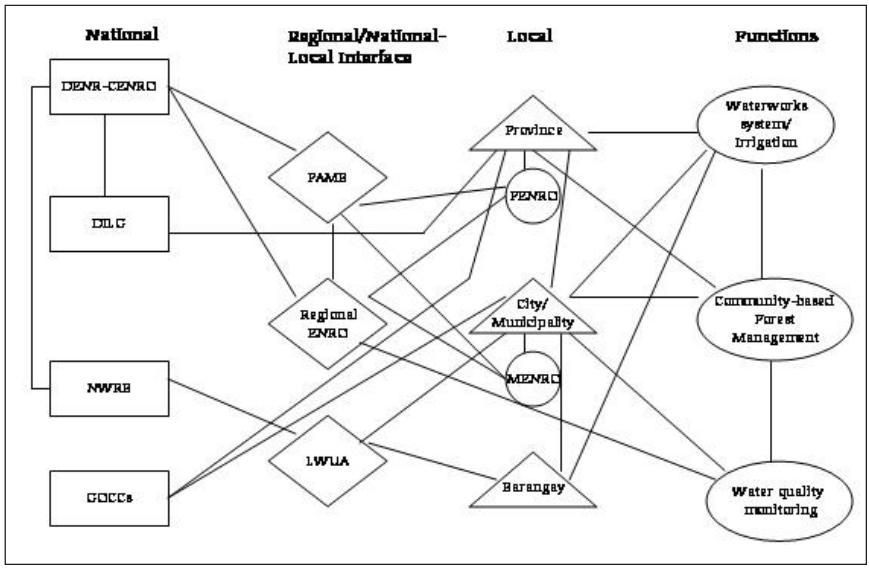
The LGUs also have a role in the multipartite monitoring team (MMT) formed within the Environmental Impact System under DENR. The System ensures that measures to mitigate pollution caused by environmentally critical projects or activities are in place, particularly in environmentally critical areas. LGUs should also mobilize local communities to participate in periodic water quality monitoring.

National-local interface

The Philippines' legal framework allows some dichotomy in terms of functions and jurisdiction in water resource governance. Local governance functions, as mentioned in the previous discussion, deal with the CBFM, waterworks system and water quality monitoring but the LGUs' decisions and actions are bounded by powers at the central level. Thus, the importance of the interface between the national and local level institutions (Figure 2).

DENR's presence at the regional level is made through the Regional Executive Director. It has the Provincial Environment and Natural Resource Office (PENRO) and the Community Environment and Natural Resources Management Office (CENRO) at the local level. CENRO could cover one municipality or more. At the same time, according to the LGC, the positions of environment and natural resource officer (ENRO) are also optional for provincial, municipal, and city governments. Thus, to implement projects, including those in small watersheds serving as source of potable water or irrigation to the community, a Memorandum of Agree-

Figure 2. National-local government interface in water resources governance



ment (MOA) has to be forged among DENR, DILG and the LGU concerned.

Meanwhile, the Protected Area Management Board (PAMB), composed of the DENR, relevant LGU and NGO, and a community representative, is mainly responsible for the implementation of the National Integrated Protected Areas Act at the local level.

Co-management of certain watersheds supporting facilities of local water districts has also been made possible through an agreement between NWRB and LWUA (Javier 1999). Similarly, devolving watershed management functions from water districts to LGUs could be done through a presidential proclamation or a Memorandum of Agreement (MOA) between the DENR and LGUs.

GOCCs, as noted earlier, could also be assigned to exercise jurisdiction and control over certain watersheds. They must coordinate, however, with the LGUs in the localities where their projects are to be undertaken. A MOA on project implementation could thus also be drawn up among the GOCCs and the LGU.

Dynamics of water governance

The system of water governance in the Philippines involves many institutions at both national and local levels. Various policies emanating from the central government recognize the need to protect the watershed. However, the implementation of these policies has been marked by some gaps and lapses. Issues emerging from local experiences point to the lack of coherence of multiple policies and weak coordination of water institutions, the need to empower the NWRB and LGUs (and earmark part of the latter's share of the national wealth for watershed conservation), and enhance law enforcement. Some of the issues and lessons are illustrated in a case study in Bukidnon, which is discussed in the next section.[1]

Coordination of multiple institutions

While there is an integrated plan for water resources development and management in the Philippines (JICA 1998), there is no explicit mechanism to link watershed management (supply side) with water uses and water quality management (demand side). Neither is there a premier organization to harmonize plans and programs of the various agencies concerned with watershed management and those responsible for water resources development. The lack of integration has resulted in fragmented efforts and even conflicts among institutions.

For instance, there is no clear coordination between the NWRB and DENR in implementing their respective programs except the fact that the DENR sits as a member of the NWRB Board. Within DENR, there is no explicit coordination between the FMB, which deals with forest management activities, and the EMB, which is responsible for the country's Environmental Impact Assessment System. Even in water quality monitoring, there is apparently no coordination of activities, and coherence of methodologies and standards among agencies involved, as in the case of the DENR-EMB and the DOH.

The NWRB is envisioned to integrate water resources management efforts in the country. However, it needs some institutional strengthening to carry out its mandate effectively. Currently, the NWRB only has its

[1] Bukidnon is the province covering the Manupali watershed, the study site of the Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM CRSP), which harnesses participatory research for better natural resource management decisionmaking.

Metro Manila office, making nationwide coordination difficult. It needs to be more visible around the country by putting up branch offices such as at the watershed level. Aside from the two major river authorities earlier mentioned, the other river basins identified by the NWRB have no clear system of governance. Apparently, management scope is at the water district or local government level.

The transfer of NWRB from DPWH to the Office of the President effectively abolished the Presidential Task Force on Water Resources Development and Management. The replacement of DPWH by DENR in the NWRB Board restricts coordination for projects involving the DPWH. With the looming takeover of the NWRB by the DENR as a Bureau, the role of the NWRB Board becomes ambiguous.

Water governance at the local level affects interfacing with higher levels of government. Experiences at the local level illustrate weak coordination and information gaps between national and local government entities. This is true of the watershed management in Bukidnon, according to key informants.

The Valencia Water District (VWD) in Bukidnon has a watershed management program, as it recognizes that watershed is a major source of water supply. It undertook reforestation activities in certain portions of the watershed but experienced some problems during harvesting time. When it needed to cut trees in the upper or lower portion of the watershed, it was not clear to the VWD where to secure the needed permit or clearance, whether from the DENR or from the Department of Agriculture (DA). This is an indication of an information gap and loose coordination among the agencies involved. In the first place, there was no clear guideline on what tree species the VWD could plant—whether for protection forest, implying that no tree cutting may eventually be done, or for production forest, which may be harvested for livelihood in the short term. There were likewise no clear guidelines delineating these types of activities. Such ambiguity was also experienced by the NPC-Pulangui IV hydroelectric plant constructed along the Pulangui/Manupali watershed.

This local experience highlights the importance of defining institutional arrangements right at the onset of any watershed project. The role of the DENR, DA, other agencies, and LGUs in watershed management should be clear to avoid management conflict. A memorandum of agreement could also be executed to stipulate each party's responsibility over

the management of the watershed. Congress also has the legislative (Art. XII, Sec.4) power to determine the specific limit of forestlands and national parks, and delineate areas of responsibility on the watershed.

Shifting of power to local government units

Decentralization is one strategy of transforming local government units into centers of policy decisions and actions. The national government could delegate powers, responsibilities and resources to local government levels on grounds of efficiency, accountability, manageability, and autonomy. The objectives are to develop the administrative capacity of subnational units, improve coordination, integrate isolated or lagging areas into wider economies of scale, and improve efficiency (Rondinelli and Cheema 1983, cited in Cariño n.d.). In the Philippines, the Local Government Code of 1991 paved the way for the devolution of water management to some extent.

Governance without local capability such as financial capacity will not bring about autonomy. For this reason, the LGC has been criticized in various fora for its "unfunded" mandate. The devolved budget represents only 8.64 percent of the DENR budget before devolution. The devolved personnel represent only 4.20 percent of the total DENR personnel before devolution (Manasan 2001), involving about 895 personnel (Brillantes 1996). These were mainly community development officers and community development assistants but others were reportedly doing nonforestry-related functions.

There are at present 15 regional offices, 73 PENROs, and 171 CENROs (Manasan 2001). Coordination between ENROs under DENR and those under LGUs is therefore very important.

The LGC also serves as the legal framework for local initiatives to enhance the revenue-raising capacity of LGUs. However, lack of awareness among concerned sectors of the provisions of the LGC deprives them of their share in national wealth. The LGC has to be amended to clarify the definition of national wealth to avoid further ambiguities and conflict. The implementing rules and regulations concerning utilization of national wealth must also be clarified.

Access of LGUs to national wealth is another issue. Notwithstanding their knowledge of such a policy, getting their share depends on their

capability to prepare proposals and negotiate with concerned government units.[2]

Here is an example of LGUs' failure to get their share of the national wealth even if they are clearly entitled to it. DOE Circular No. 2003-03 stipulates that the energy resource developer/power producer should allocate one centavo (PhP0.01) per kilowatt-hour of the generated electricity sales to the host barangays, municipalities/cities, provinces and regions where the energy-generating facilities are located. Part of this share goes to watershed management projects.[3] However, as was the experience in Valencia, the water district directly remits its revenues to the National Treasury rather than to the LGU concerned, as stipulated in the LGC.

In the case of the NPC-Pulangui IV hydroelectric plant, unclear territorial jurisdiction snags watershed conservation activities. In the NPC charter, the term "surrounding" or "embracing" the plant is vague, as it does not give any concrete definition of territorial delineation. Pulangui watershed is almost 50 percent of the province of Bukidnon, too large and impractical for NPC to manage. Moreover, watershed management entails not only huge costs but also a strong technical capability on the part of NPC.[4]

Based on the DOE Circular cited above, the beneficiaries cover a vast area such that funds may be spread out too thinly. Moreover, the municipalities (upstream), where the source of water is located, are not entitled to any share, when they are also affected by the plant's activities. The provision on subsidizing the cost of electricity could encourage use of electricity, thus negating the principle of resource conservation.

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[2] The project proposal should be endorsed by the Sanggunian or regional development council. It should also be coordinated and endorsed by the DENR Regional Office to the Department of Energy for review and approval.

[3] This one-centavo share should be apportioned—one-half for electrification fund (EF), one-fourth for development and livelihood fund, and one-fourth for reforestation, watershed management, health and/or environment enhancement fund. Half of EF goes to electrification and part of the other half goes to reforestation, watershed management, and environment enhancement projects. If there is more than one host LGU, RWMEEF shall be equally divided, or, if there is clear delineation of boundaries, allocated based on percentage of land area.

[4] The looming privatization of the NPC could improve the management regime of the Pulangui watershed. However, it has to be proclaimed first by law as a critical watershed before it could be devolved to an agency, not necessarily NPC. This in return will require an area management plan.

To motivate LGUs to protect the watershed, they must be assured that taxes collected from the declared protected area go directly to the PAMB. This would ensure continuous budgetary support for their efforts. This would also serve as an incentive for LGUs to push for the declaration of protected areas in their locality.

Enhancing LGUs' regulatory powers

The LGC also grants LGUs certain regulatory powers in terms of law enforcement. Among LGUs, only the provinces are mandated to enforce forestry laws, which in return are limited to community-based forestry projects, pollution control law, and other environmental protection laws. There are other gaps and lapses in law enforcement at the local level. For example, the mandate sets a limit to the powers of the local government within the said range of activities but does not provide clear political nor administrative boundaries. Given such limited authority, the local government cannot enforce laws in an undevolved domain.

Similarly, insufficiency of financial resources and mechanisms makes it difficult for LGUs to institutionalize mechanisms for law enforcement.

Poor compliance with laws due to the laxity of penalty is another difficulty confronting LGUs where their regulatory powers are concerned. LGUs could only impose, for example, a maximum fine of PhP5,000 (around US$100) unlike national agencies, which could impose a much higher penalty. As experienced by NPC, power generation has been affected by deteriorating water conditions due to human activities in the surrounding watershed. Despite local ordinances, it was reported that timber poaching, illegal cutting of trees, and other hazardous activities persist in the watershed.

There are already proposed amendments to the LGC in the Philippine Congress. These include proposals to make the positions of ENRO mandatory in all cities and municipalities, to create a local environment and natural resource board, and to increase the share of LGUs in the national wealth.

Amid all these difficulties facing LGUs concerning watershed protection, some of them have taken steps to address the problem. Bukidnon is a good example. Its provincial government, recognizing the urgent need to preserve the environment, has created its own Bukidnon Environment and Natural Resource Office (BENRO). DENR-EMB also orga-

nized the MMT in Bukidnon to monitor compliance with the Environmental Management Plan. The chair on environment of the Sangguniang Panlalawigan (Provincial Council) heads the MMT, with PENRO as co-chair, and BENRO as the secretariat. This provides a mechanism for close coordination among DENR, LGUs, and other sectors in the locality. In the Lantapan subwatershed, communities have been mobilized to participate in water-monitoring activities (Rola et al., Chapter 8, this volume).

These efforts may be replicated in other local areas to institutionalize closer coordination among various institutions and sectors.

Integrated water management: answering boundary questions

Interaction among agencies and government units at the regional, provincial and municipal levels is crucial in an integrated watershed management scheme. Although each has a specific mandate or concern (e.g., land, soil water, soil) or area of responsibility (e.g., development planning, law enforcement and regulation), they can coordinate their efforts to make possible an integrated water management plan.

Integrated watershed planning is widely considered to be the most effective way of consolidating water and land use activities, water quantity, and quality management (Dixon and Easter 1986; Fellizar 1998). Integration implies coherent development and management planning and implementation of projects and programs considering the social, economic, institutional and political factors. It provides a common ground for consolidating sectoral interests and territorial dimensions. It involves coordination of activities on both the supply and demand sides of water resources within defined boundaries such as watersheds.

In Bukidnon, one policy initiative along this line was the creation of the Bukidnon Watershed Protection and Development Council (BWPDC) through Memorandum Order No. 270 that was signed by former President Fidel Ramos. BWPDC formulated the Bukidnon Watershed Management Framework Plan to serve as guide in implementing programs in the six major watershed clusters in Bukidnon.

Conclusions and recommendations

Success or failure in policy implementation depends on the powers and functions of each level of government. In the Philippines, the loci of water and watershed management policies and decisions largely lie in the

national government, and to a certain extent, the local government. Despite the recognition of the critical importance of watershed conservation, problems remain in both vertical and horizontal integration in water governance. Specific responsibilities for water quality, water quantity, and watershed management are relegated to different government entities, sometimes resulting in fragmented efforts.

Aside from the agencies' weaknesses to perform their mandates, there are setbacks to interagency linkages at the national and local levels. Mechanics on how to achieve coordination within an integrated framework have to be laid out. Facilitating factors to achieve coordination are the harmonious working relationships among institutions, procedural certainty and clarity, interagency consultation, and cooperation in the development and implementation of policy (Boston 1992).

Institutional arrangements must clearly specify the roles and responsibilities of each party to consider site-specific interests, thresh out possible conflicts and other complications. This involves discussion among various stakeholders of the issues of decisionmaking on water distribution and use; resource mobilization to acquire funds and personnel, among others; communication about activities, decisions, and information to perform tasks, or to feedback results; and conflict management among various stakeholders.

At the national level, the NWRB is undergoing reorganization for its eventual transfer from the Office of the President to the DENR as a bureau. This move is expected to facilitate the interface between watershed and water resources planning. The NWRB should put up field offices (watershed or river-basin level) to coordinate and integrate water resource plans and programs across watersheds in the country.

At the local level, when local political boundaries do not conform to watershed or river basin boundaries, a river basin or watershed council could provide a higher level of intervention without reducing the autonomy of local government units or agencies. In the case of Bukidnon, the existing BWPDC and BENRO should be strengthened to integrate watershed management and oversee its plan's implementation. Similar councils also exist in other parts of the country like in Iloilo (Salas, Chapter 9, this volume).

The proposed Water Resources Management Act adheres to an integrated management approach, i.e., formation of basin or watershed au-

thorities working within a national framework of governance. Unfortunately, this bill was shelved in the Twelfth Congress.

The Philippine Association of Water Districts, for its part, could pursue water quality monitoring activities as part of its watershed management program. It could also intensify its information campaign to orient the community, especially the farmers, on the potent threats of agrichemicals and other pollutants to water quality. These activities have to be coordinated with LGUs, EMB, DA, and other concerned agencies. Finally, the local community participation in water quality monitoring could also be harnessed.

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5 Competing uses of water: cases of Angat Reservoir, Laguna Lake and groundwater systems of Batangas City and Cebu City

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Introduction

The public sector has traditionally taken a lead role in allocating and managing water resources. Historically, government decisions in doing so have been dominated by equity objectives, as water is considered essential to human life, to all economic activities or means of livelihood, and to the sustainability of the ecosystem. When the water supply was plentiful relative to various demands and when the cost of supplying water (i.e., storage, transport, and treatment) was low, questions of efficiency in management, sustainability of water resources, and availability of water for all sectors were neither raised nor considered relevant.

Over the past two to three decades, however, conflicts or competition among various sectors—households, industries, agriculture, fisheries—have increased sharply. Continued population growth, increasing incomes, rapid industrialization, commercialization, and urbanization have increased the demand for municipal and agricultural uses of water. On the other hand, the quantity and quality of available water resources has been declining with the denudation of forest cover, the increase of pollution of water sources, and the failure of government to effectively regulate land use to protect the water resource and preserve the environment.

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In addition, the costs of developing new sources of water supply for municipal and agricultural uses have risen sharply.

As a result, the government's task of resolving allocation conflicts among competing interests and managing water supply has become increasingly more complex, as the scope of supply-side management responses reaches its limits. The traditional approach to allocating water rights across sectors simply by *command and control* (PIDS 2002) or by administrative/legal means, and treating the raw and bulk water resource as a free good despite growing scarcity have only promoted wasteful usage, misallocated water to less valuable use, fragmented investments and management, and failed to raise revenues for the necessary regulatory and developmental functions relating to water resource management and protection. Because of the growing scarcity of water resources and escalating cost of new water supply developments, therefore, efficiency and sustainability—aside from equity—are necessarily becoming major concerns in managing the supply and demand for water.

Achieving greater efficiency and sustainability in water resource management primarily requires letting the social opportunity or scarcity cost of water be reflected in water production and consumption decisions alongside the full financial cost of water supply development and management as well as any environmental cost involved in the process of developing and using water resources.

The Philippine water laws provide the framework for allowing the scarcity value of water to be paid by its users. In particular, the 1987 Constitution declares that all water resources belong to the State. The Water Code (Presidential Decree 1067) passed in 1976 authorized the National Water Resources Board (NWRB) to grant water rights, levy the appropriate fees for these rights, and collect charges for water development. The Code also recognizes seniority of rights such that the earliest approved rights have priority over others to the use of a limited supply of water. In times of drought or any emergency, however, the use of water for domestic and municipal purposes takes precedence over agriculture or related uses. In this regard, the Code also provides that such a reallocation requires payment of due compensation to the affected sector. It likewise allows the transfer or lease of water rights in whole or in part to other parties subject to approval by the NWRB.

To this day, however, water charges collected by the NWRB are minimal and hardly able to support the proper administration of water rights. Nor do they relate to the opportunity cost of water. Furthermore, there are no clear guidelines for compensating affected sectors when water rights are reallocated to other users. Any compensation provided is typically ad hoc in nature and not necessarily related to the foregone benefits resulting from the reallocation of water. Finally, no implementing rules and regulations have been issued to govern trading of water rights, which in principle is allowed by the Water Code.

Thus, numerous cases of conflicts in water use remain unresolved and opportunities for a more efficient allocation and use of water resources through appropriate pricing of raw water or trading of water rights are still unexplored. These cases include relatively small ones such as conflicts in allocation of irrigation water between upstream and downstream farmers or the loss of second rice crop among farms in a barangay in San Pablo City, Laguna, as the use of stream water was shifted for municipal use. They also involve large water systems such as the conflicting use of Laguna Lake water for fisheries, transport, recreation, drinking water, and as a waste sink.

Several studies have shown (ADB 1996; Francisco, Chapter 2, this volume; and Contreras, Epilogue, this volume) the existence of a legal framework to introduce more economic- or market-based instruments. What is deficient is the institutional framework and technical and administrative capacity to design and effectively implement the appropriate market economic-based and regulatory instruments to manage the allocation and development of water resources more efficiently.

This chapter examines four multipurpose/multiuse water resource systems in the Philippines: a) Angat Reservoir, b) Laguna Lake system, and the groundwater systems of c) Batangas City, and d) Cebu City. In the succeeding sections, the physical system and various uses of each water resource system are described, followed by a discussion of certain management and operational issues and concerns relating to these systems, especially in the context of the competing uses of water in these systems. A summary and conclusion specific to these four water resource systems is found at the end.

Angat Reservoir

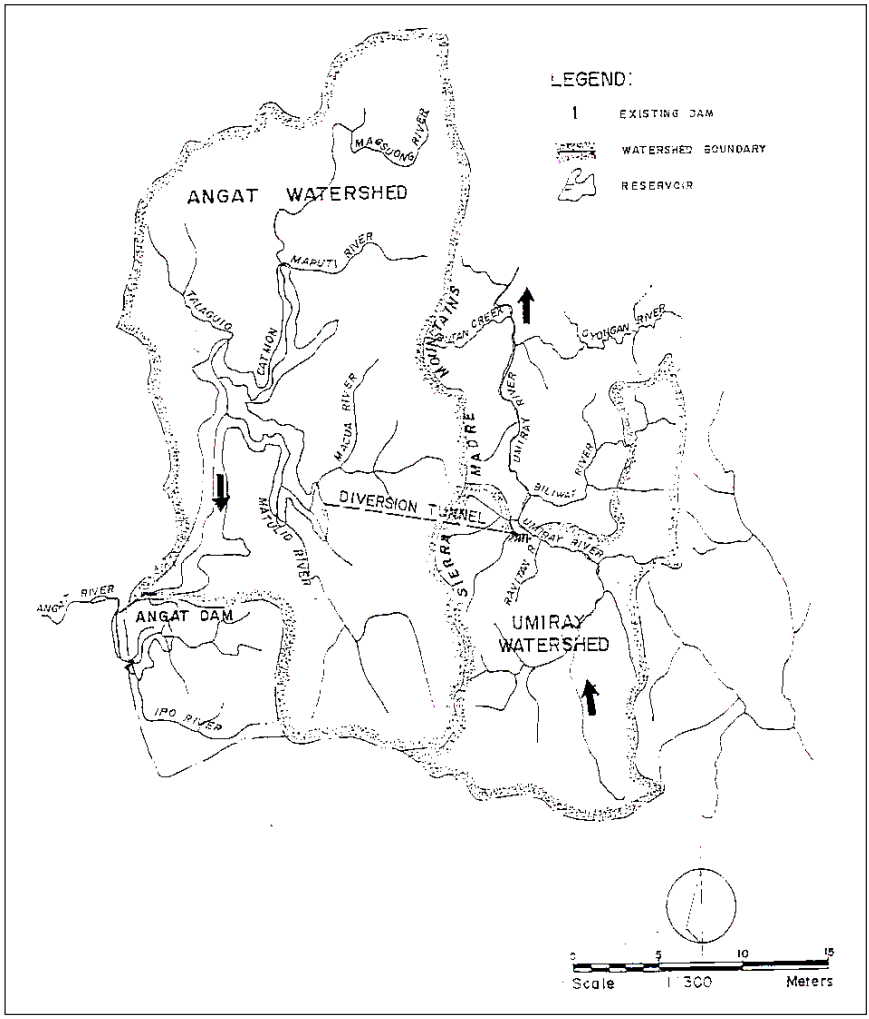
Physical system

The Angat Reservoir is a multipurpose reservoir that supplies water for: a) irrigation to over 28,000 hectares of rice and vegetable farms in Bulacan; b) domestic use in almost 65 percent of Metro Manila, which is regulated by the Metropolitan Waterworks and Sewerage System (MWSS) and distributed by private concessionaires Manila Water Company (MWC) and Maynilad Water Services (MWS); c) hydropower generation for the National Power Corporation (NPC) at an annual average of 500 gigawatts constituting about 5 percent of Luzon's power demand; and d) flood control storage incidental to the operation of the reservoir and the afterbay re-regulation dam at Bustos (for irrigation) and at Ipo (for domestic water supply).

The watershed of Angat Reservoir (Figure 1) is the Angat River basin, which has a total drainage area of 568 square kilometers upstream of the Angat damsite located across a narrow gorge of the Angat River at Sitio Biniit, San Lorenzo, Bulacan (NHRC 2002; Jose et al.1996). The Angat dam is a rockfill dam that measures 131 meters high with a 630-meter road surface top at the dam crest. The reservoir has an active capacity of 865 million cubic meters (mcm) with absolute drawdown (dead storage) elevation at 158 meters above mean sea level (amsl), spilling elevation at 217-meter amsl, design flood pool elevation at 219-meter amsl, and maximum (dam crest) elevation at 223.5-meter amsl.

The Angat Reservoir has two major release gate structures: 1) the main hydropower turbines with maximum output of 200 megawatts (mw), where the water released is re-regulated downstream at Bustos dam; and 2) the auxiliary hydropower turbines with maximum output of 46 mw, where the water released is re-regulated downstream at Ipo dam. Bustos dam is an afterbay regulatory dam that stores hydropower peak releases of the Angat Reservoir and whose final release of flow goes to the Angat-Maasim River Irrigation System (AMRIS) of the National Irrigation Administration (NIA). Ipo Dam, on the other hand, regulates water release from the auxiliary hydropower plant prior to being discharged to the MWSS transmission system (Figure 2) composed of three Ipo-Bicti tunnels, five Bicti-Novaliches aqueducts, and the Novaliches portal for flow splitting to the MWC, the east zone water concessionaire with an allocation of 18.4 cubic meters per second (cms), or 40 percent of the

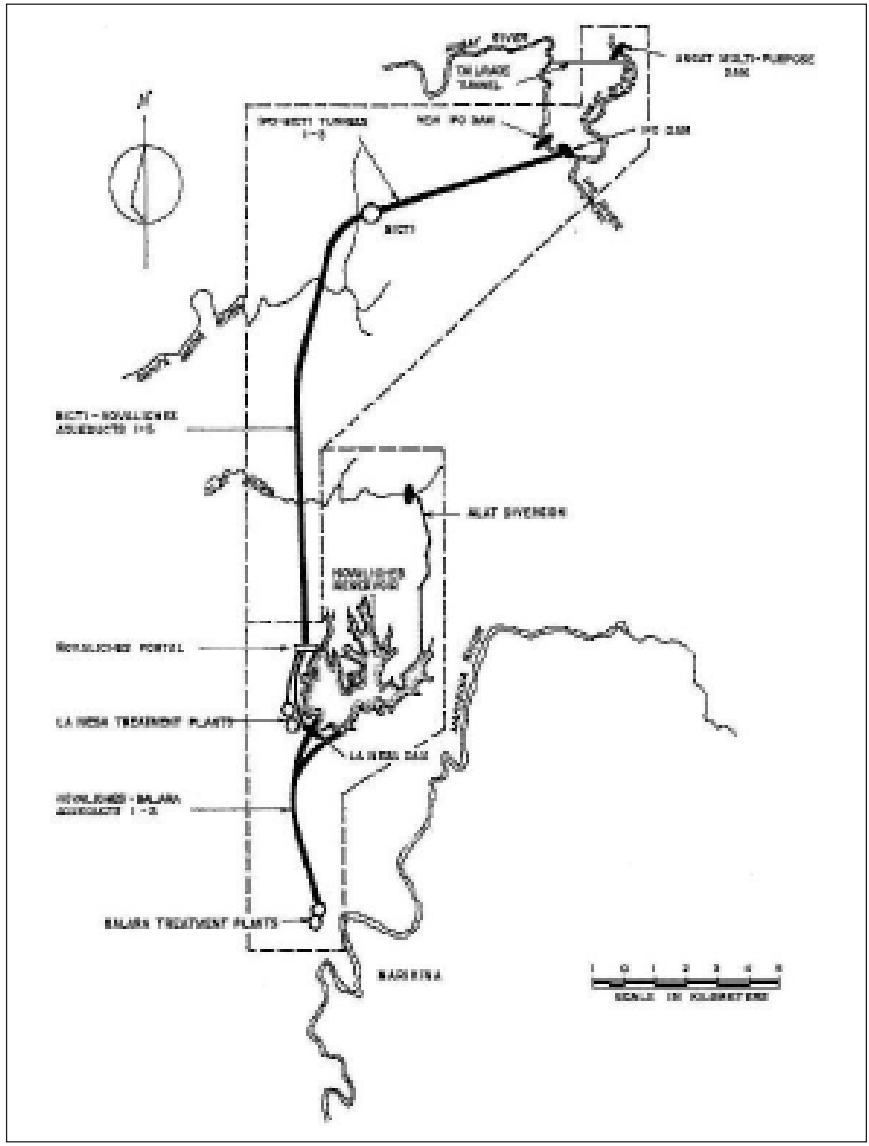
Figure 1. Angat River and Umiray River basins



total MWSS water demand of 46 cms; and to the MWS, the west zone water concessionaire with an allocation of 27.6 cms (60 percent of the total MWSS water demand). Bustos Dam and Ipo Dam gain additional water from their local inflow watersheds with drainage areas of 242 and 70 square kilometers, respectively.

Inflow to Angat Reservoir derived from rainfall in the watersheds alone measures an annual average of 60 cms. Since year 2001, however,

Figure 2. Angat Reservoir and MWSS headworks



inflow to the reservoir has been augmented by diverting water from the Umiray River watershed through the 13.1-kilometer Umiray-Angat transbasin tunnel with a carrying capacity of 25 cms. The Umiray-Angat transbasin project (UATP) is estimated to bring an average annual inflow

of about 9 cms to Angat Reservoir, bringing to 69 cms the total annual average inflow to Angat Reservoir.

Water rights/demands and reservoir release policy

Currently, the water rights of MWSS is 31 cms, which is the sum of its original water rights of 22 cms granted by the National Water Resources Council (now the NWRB) in 1979 and the additional 9 cms obtained from the UATP in 1998. The NIA water rights for the AMRIS (to irrigate over 28,000 has of land) is 36 cms, which has been reduced from the original NIA water rights of 40 cms in 1927. Since the MWSS and NIA releases go through the hydropower turbines, the NPC allocation essentially constitutes the water allocations for MWSS and NIA. However, water release for hydropower generation is considered *transit* water and is *nonconsumptive* in contrast to releases for domestic water supply or irrigation water. The remaining 2 cms out of the 69 cms average annual inflow to Angat Reservoir is reserved as minimum instream flow of the river for environmental protection and other purposes.

The water allocations of MWSS and NIA generally coincide with the actual water demands or usage of these agencies' clients. However, NIA, in particular, had seen some reduction in its users' water demand. Thus, in 1988, through a NWRB resolution, MWSS was granted an additional allocation of 15 cms for any unutilized portion of NIA irrigation water, provided that NIA had already sufficiently delivered and satisfied the irrigation water needs.

To satisfy the water demands for various uses, the Angat Reservoir release policy is based on the reservoir level called *rule curve*, which decrees: a) an upper rule curve when the water level in the reservoir is above 212 meters; and b) a lower rule curve when the reservoir level is 180 meters. The following releases are made on this basis (Maloles 1996):

- *When water level is above the upper rule curve*: All domestic water supply and irrigation water demands, including instream riverflow requirements, are satisfied and power is generated at the capacity of the hydropower plants.
- *When water level is between the upper and lower rule curves*: All domestic water supply and irrigation water demands are satisfied. However, power generation is limited to the releases made for domestic water supply and irrigation water.

- *When water level is below the lower rule curve*: The domestic water supply is satisfied first by whatever water is available in the reservoir and power generation is limited to the releases from the auxiliary hydropower plants. Irrigation water may be curtailed and is satisfied only by whatever water remains from Angat Reservoir or what is obtainable from local inflows of the watershed or intermediate catchment at Bustos Dam. In practice each year, the reservoir elevation by the end of June should not go below 160 m.

Irrigation water versus domestic water supply releases

The ever-increasing demand for domestic water supply in Metro Manila has been cause for concern. Water demand projections could reach as much as 60 to 65 cms by year 2010 (David et al. 2000). The Angat Reservoir water allocation for domestic water supply in this case will no longer be enough. Hence, other water sources must be developed. Another option is for NIA to give up its irrigation water allocation from Angat Reservoir. Reduction in irrigation water allocation, however, is only possible if certain irrigated, agricultural lands are retired and converted into land uses that require less water such as industrial or recreational parks.

In an Asian Development Bank (ADB 1996) study, the price of raw water at Angat Reservoir for MWSS was estimated at P0.80 per cubic meter during wet years and P5.70 per cubic meter during severe dry years or drought conditions. For industrial users, the price of water ranged from P1.30 to P8.00 per cubic meter. On the other hand, the estimated cost of compensating farmers during drought conditions ranged from P1.60 to P2.90 per cubic meter while the foregone hydropower benefits amount to P0.20 per cubic meter. During dry years or drought conditions, when water is drastically needed to satisfy domestic water supply, it may be economically beneficial for AMRIS to sell its irrigation water entitlement to MWSS as raw water for domestic water supply, provided that MWSS compensates the farmers at AMRIS for the reduction or curtailment of their irrigation water supply as well as NPC for the foregone hydropower revenues.

In the recent past, however, the trading of irrigation water for domestic water supply has not been as simple as might have been expected.

For instance, during the El Niño period in 1997 that caused severe water shortages in the country, the actual water released to MWSS was an average of 32 cms when its water allocation then was only 22 cms. The increased amount of release was made at the expense of Bulacan farmers who experienced massive crop losses. This case was recounted in a personal communication between two NIA officials (Pascua and Payawal 2002):

> "NIA, realizing the need to serve Metro Manila needs, agreed to temporarily give up part of its water allocation for a price. In 1997, to address the critical condition of the Angat Dam brought about by the El Niño phenomenon of 1997-1998, NIA decided to suspend the operation of AMRIS for the whole dry cropping season, including the cut-off period, in favor of domestic water supply. MWSS shall draw water at 32 cms (average) on condition that MWSS shall compensate NIA and the farmer-beneficiaries adversely affected during the said periods for the opportunity loss in terms of unrealized *irrigation service fee* (ISF) on the part of NIA and unrealized harvest/income on the part of the farmer-beneficiaries.
>
> However, the claims for compensation package due to the reallocation of water in the Angat Reservoir from irrigation to domestic water supply is [sic] still under debate between NIA and MWSS. (The) latest compromise is to seek legal opinion from the Office of the Government Corporate Counsel through the Department of Justice."

Until now, however, the case filed is still awaiting resolution by the Department of Justice.

Water transmission capacity limitations of Angat Reservoir to MWSS

In case additional Angat Reservoir water will be made available to MWSS, the transmission capacities of Ipo-Bicti tunnels as well as Bicti-Novaliches aqueducts will have to be increased. Based on a report of the National Hydraulic Research Center (NHRC 2002b), the total (combined) capacity of the three Ipo-Bicti tunnels is 39.02 cms compared to the original design capacity of 53.4 cms while that for the five Bicti-Novaliches aque-

ducts is 49.75 cms compared to the original design capacity of 51.7 cms. The reduction in capacity may be due to the age of the tunnel or aqueduct or to higher actual head loss in the system than what was estimated in the design.

What is glaring in this finding is that the Ipo-Bicti tunnel restricts the water delivered to MWSS to about 39 cms when in fact MWSS can potentially draw a maximum of 46 cms from Angat Reservoir, that is, from the MWSS water allocation of 31, plus the 15 cms (conditional/residual water) from NIA. In the NHRC (2002a) report showing measured flows from January through November 2001, actual water releases from Angat Reservoir to Ipo Dam fluctuated from 20 to 50 cms, but the computed flow releases from Ipo Dam to Ipo-Bicti tunnels were limited and hovered at around 38 to 39 cms.

Reservoir hedging rule to increase reliability to satisfy demands

As discussed earlier, the releases for water supply and irrigation (including additional releases to satisfy hydropower generation demands) from the Angat Reservoir depend on prevailing or current reservoir levels called *rule curves*. These rule curves are fixed or static, since they were developed based on historical hydrology and past experiences with the system. This release policy, however, is considered myopic because it only considers current reservoir levels.

A more dynamic as well as anticipatory release policy is the so-called *reservoir hedging rule*, which can perhaps be used for the Angat Reservoir. This operating rule is employed with a reservoir optimization scheme to determine the reservoir releases for, say, the next four to six months based on forecasted future inflows and current reservoir levels. Although the Angat Reservoir normally has less-than-a-year carryover storage (i.e., reservoir capacity of less than the annual water demand), this hedging rule may be applied within the year (on a monthly basis) to increase the reliability of satisfying the various water demands. Where forecasting reservoir inflows are concerned, a simple or high-order Markovian time series model[1] may be used for this purpose since the Angat inflows exhibit certain temporal dependence.

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[1] In a simple or first-order Markov time series model, the streamflow today (say time *t*) can be determined by using only the streamflow of yesterday (at time *t-1*). For higher-order models, the streamflow today is determined by using streamflows of several days ago.

The reservoir hedging rule can likewise be implemented in flood operations with short-term forecast of reservoir inflows. For instance, sometime in 1976, the area downstream of Angat Reservoir was flooded, causing significant physical damage and loss of lives downstream of the reservoir. The resulting flood occurred two to three days after the big rains. The problem may have been due to the failure to anticipate the time of arrival and magnitude of floodwater inflows into the reservoir. Thus, when the flows finally came, floodwaters had to be immediately exhausted from the controlled release gates of the reservoir in addition to spillway release to prevent the overtopping and possible damage of the dam. Still, the tragedy occurred. If anticipatory, and if dynamic operating rules were in place, this accident could have been avoided.

Metro Manila domestic water supply beyond Angat Reservoir

The Angat Reservoir is a vital water resource system to Metro Manila. Almost 97 percent of MWSS's water supply comes from it although MWSS serves only about 65 percent of the population of Metro Manila. Expansion of the MWSS service area to serve the entire population of Metro Manila will roughly require an additional 25 cms raw water supply to the current water demand of 46 cms. Definitely much more water is needed to meet future demands. The Angat Reservoir water resource system is virtually exhausted so that MWSS has to look at alternative water sources such as the Laguna Lake and the proposed completion of the Laiban Dam. The amount of raw water planned to be extracted from Laguna Lake is only about 3.45 cms, or 300 million liters per day, which is definitely inadequate to meet water needs. The Laiban Dam appears to be the best alternative water source and quite significant, because it is estimated to provide as much as 22 cms raw water supply.

The Laiban Dam receives water from the Kaliwa watershed in the east slope of the Sierra Madre mountains, which has a Type IV climate, characterized by wet season almost all year round. This is in contrast to the Angat River watershed, which has a Type I climate that has distinct dry and wet seasons. In any case, water inflow to the Laiban Dam can be further augmented by diverting water from the Kanan watershed adjacent to Kaliwa watershed as done in the UATP.

Laiban Dam is definitely a significant and reliable source of water supply for Metro Manila. Its completion, though, could now cost over

P30 billion, consequently requiring an increase in water rates. This is a choice that Metro Manila must face—bear the cost of construction now or suffer severe water shortages in the future. Estimates of the price of water from the Laiban Dam in the mid-90s ranged from P13 to P15 per cubic meter. Its present rate could already be about P19 to P22 per cubic meter. This could still be affordable considering that vended water in Metro Manila costs as much as P40 per cubic meter.

Laguna Lake system

Physical system

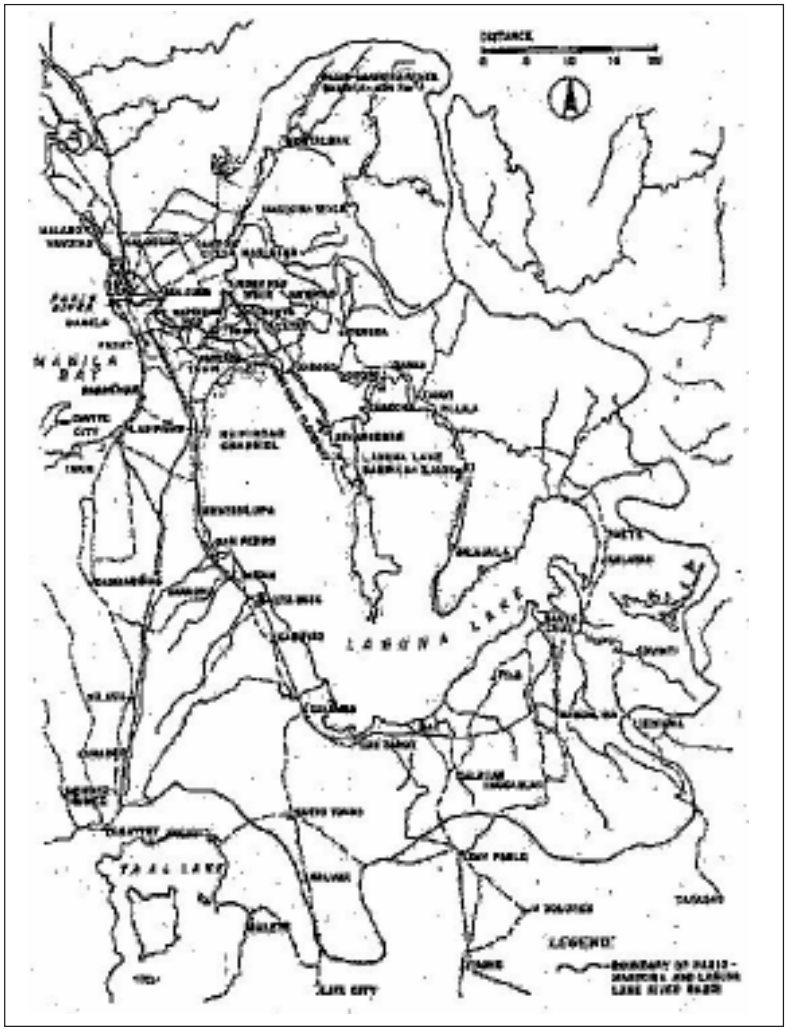
The Laguna Lake, also known as Laguna de Bay, encompasses Metro Manila, Rizal, Cavite, Batangas, and Quezon provinces, as shown in Figure 3. The land area covered by the entire basin is about 2,865 square kilometers while the lake area itself, including Talim Island, is about 900 square kilometers. Twenty-four watersheds/river systems flow into the lake, 22 of which are under the jurisdiction of the Laguna Lake Development Authority (LLDA), the lead implementor of the Laguna de Bay master plan (*LLDA Primer*, n.d.). The biggest watershed is the Marikina River basin located north of the lake, and the second biggest is Pagsanjan River in the southeast part of the lake. The two watersheds outside of LLDA jurisdiction are the San Juan River basin and the Pasig River basin.

Like the Angat Reservoir, Laguna Lake is also a multipurpose water resource system. It is used for: a) flood control, b) fisheries production, c) navigation, d) Caliraya Reservoir-Kalayaan hydroelectric pumped-storage system, e) domestic water supply, and (f) irrigation. Proper management of Laguna Lake should not only be confined within the lake but should also extend to the proper management of watersheds contributing to the lake.

Who benefits from the lake's flood control?

As mentioned earlier, the Marikina River basin is the biggest contributing watershed to the lake which drains into the Pasig River and into Manila Bay. During the flood season, parts of the city of Manila lying along the Pasig River get flooded. To alleviate flooding, the current operating rule is that when the Marikina River stage at its Santo Niño station is greater than 14.5 meters, the gates at Rosario weir will be opened to let the

Figure 3. Laguna Lake and vicinity



floodwaters enter Mangahan floodway towards the lake. One can ask if this is the proper way to operate the floodgates, especially without considering the downstream end conditions such as the lake water stage or Pasig River stage. This flood control scheme is designed to protect Manila from being flooded, but it does not take into account the effect on the lakeshore towns around Laguna Lake. Since the Mangahan floodway was built, there have been cases of floodings along Taguig and Taytay and

even way down south in Santa Cruz and Los Baños. Some people perceive these incidents to be the consequence of the construction of the Mangahan floodway.

There are proposals to build dikes and embankments to protect certain lakeshore towns. The design in terms of the height and extent of these dikes is expected to be cause for concern, since it may affect the flooding situation in other parts of the lake due to the reduction of its effective flood storage volume. This concern also applies to the West Mangahan road-dike system that the Department of Public Works and Highways (DPWH) is currently constructing to protect portions of Taguig and Taytay, Rizal from Laguna Lake floodings. Concerned groups fear it could suffer the same fate as the Mangahan floodway, the construction of which resulted in floodings.

A related issue is the possible adverse impact of the flood control mechanism of Laguna Lake for fisheries production. The floodwaters of Marikina River diverted into the Mangahan floodway come at a large volume with sediment-laden flows, resulting in high lake water turbidity and adversely affecting lake primary production due to the inability of light to penetrate the lake bottom.

Fisheries requirements versus lake withdrawal for domestic water supply

The Laguna Lake case illustrates certain conflicts in the quality requirements for various uses of water resources. For instance, saltwater from Manila Bay through the Pasig River is allowed to enter Laguna Lake, which is desirable to the fishing industry. On the other hand, lake withdrawal for domestic water supply requires only a minimum salinity standard in contrast to the fisheries salinity requirement. Thus, the question is how to properly manage saltwater entering or exiting the lake through Pasig River, which can be controlled by the Napindan Hydraulic Control Structure, in view of two conflicting water quality (salinity) requirements for fisheries and domestic water supply. Salinity levels of 2 to 6 parts per thousand (ppt) observed in the lake are desirable for fish production but treatment of water for domestic water use could be too expensive for water with a salinity level greater than 0.3 ppt.

For fisheries production, saline water tends to clean the lake from turbidity brought about by rivers during the wet season. In this case, the

saline solution functions as flocculants to promote sedimentation of suspended particulates that causes turbidity. Note that the height of saltwater intrusion into the lake is observed during the latter part of the dry season, when lake levels are low and Manila Bay tidal levels are high. During this period, too, the saline water from Manila Bay carries nutrients, specifically diatoms that are greenish in color and found to be very nutritious for fisheries.

Lake pollution control and effects on fisheries

Laguna Lake is a major waste sink of Metro Manila as well as of the various highly urbanized towns surrounding the lake. All kinds of pollutants are dumped into the lake but the most toxic substances are the so-called endocrine disrupting chemicals such as heavy metals. Catalan (2000) states an alarming number of contaminated fish species found in the lake. These are bolstered by reports from fishermen and specimens collected showing the presence of fish with crooked spine, without tails, blind, or with skin cancers. There are also reports of effects on people living along the shores of the lake who eat contaminated fish. Some of their children develop reproductive deformities, immune deficiency and mental or physical growth deformity.

The degree of lake pollution from industrial effluents or domestic waste around the lake varies within the year due to the seasonality of the dilution effects of freshwater inflows from watersheds around the lake, including rainfall. The dry season is the worst condition, when lake inflows and rainfall are low, thus reducing pollutant dilution. To properly manage lake pollution, the LLDA should take the monitoring of lake water quality seriously to be able to detect the sources (including timing and spatial extent) of pollution. Only then can it take appropriate actions against these polluters, whether natural or man-made, through treatment, penalties, or closure of pollution sources.

Optimal lake use zoning

Fisheries is a big industry in Laguna Lake, a major portion of which is devoted to fisheries—from commercial fish production that uses fish pens and fish cage structures to individual, subsistence fishing. LLDA derives significant revenue from the rental of the lake area for fish pens and cages. This prompts one to ask: How many hectares of the lake area

should be allocated to commercial fish production and where should the fish pens and fish cages be located without affecting the water quality dynamics and health of the lake? In 1995, the total area of the lake covered with fish pens and cages was about 15,140 hectares (ha). In 1999, the said area was found to have been reduced to 11,160 ha (with fish pens occupying about 6,160 ha and fish cages about 5,000 ha). This was attributed to a strong typhoon that destroyed fish structures in 1997. Water quality in the lake in terms of the biochemical oxygen demand was about 12.5 mg/l in 1996 and about 10.4 mg/l, an improvement, in 1999 (Catalan 2000). This indicates that there is an optimal number of hectares in Laguna Lake that may be devoted to commercial fish farming.

The recent incidence of fish kills in Bolinao, Pangasinan, is proof of this. The fish kills were attributed to low levels of dissolved oxygen to sustain fish population. Depletion of dissolved oxygen might have been caused by fish overcrowding or poor aeration of the water body. Poor aeration, in turn, could have been due to limited water circulation. Thus, there must be some limit to either the number of fish population per unit area or to the area for fisheries production to enhance lake circulation and ensure adequate water aeration. The fish pens or cages in the lake may also be designed in such a way that they will not adversely affect lake circulation.

The optimal lake use zoning issue can best be solved with an interdisciplinary effort. The question of how much area and how many cropping seasons a year are required for fish production entails, for instance, the following investigations or studies: a) economic analysis of costs, prices, and externalities of alternative optimal lake zoning plans or configurations; b) water quantity and quality modeling of lake dynamics that lead to the various alternative plans; c) ecological modeling of food web and fish production; and d) sociopolitical analysis of what essentially constitutes livelihood to the people living around the lake.

Dredging to maintain lake navigation lanes

One of the other uses of the lake is navigation by commercial boats to shuttle people around or to transport goods from one town to another around the lake. As a result, every few years, the navigation lanes in the lake become shallow due to siltation or sedimentation. Maintaining these navigation lanes or channels requires dredging, which is undertaken when

funds are available. An adverse effect of dredging on the lake, however, is turbidity although it only lasts less than a year. The greatest risk in dredging is the resuspension of toxic or hazardous materials or substances that may have already been buried deep in the lake bottom. One way to contain toxic materials is to isolate the area to be dredged using movable cofferdams. Dredging may also be done by direct suction of materials into boats or barges and shipping them out of the area.

Upland watershed river diversions versus lake inflows

Portions of the riverflows of Siniloan and San Juan Rivers (contributing to Laguna Lake) are diverted for irrigation and industrial water supply instead of having them reach the lake as inflows. In Siniloan, for instance, NIA operates an irrigation system from water diverted from Siniloan River. An industrial park and a golf course use part of the water diverted from San Juan River. Perhaps the current amounts of riverflow diversions for irrigation and other purposes may be insignificant to affect lake dynamics. Yet, freshwater demands from riverflows may significantly increase in the future and jeopardize lake inflows.

Freshwater inflows to Laguna de Bay play an important role as a dilution agent to reduce lake pollution and repel or control excessive saline water entering the lake from Manila Bay through Pasig River. Thus, any drastic curtailment of freshwater inflow to the lake due to excessive river diversion may be detrimental to the survival and maintenance of aquatic life and biotic communities in the lake. Within the watershed, optimal management of river diversions is needed to ensure that the downstream instream flow requirements are satisfied.

Batangas City groundwater system

Physical system

The City of Batangas and its vicinity almost solely rely on groundwater for domestic, industrial and commercial uses. It sits on a regional deep, confined groundwater aquifer that extends over 30 kilometers from the town of Bauan in the north to Mt. Pinamucan in the south, and about 35 kms from Lipa City in the east along the west coast of Batangas Bay in the west (Figure 4). Packets of unconfined, shallow groundwater aquifers are usually found in the inland portions of the region, but some shallow aquifers extend along the coast of Batangas Bay.

Figure 4. Batangas City and vicinity

Competing groundwater uses/users

The Batangas City Water District (BCWD) pumps an average of 1.0 cms (based on NWRB water permits granted in 2000) from the deep aquifer for its domestic and commercial customers. Heavy industries along the coast of Batangas Bay such as Pilipinas Shell, First Gas, JV Industries, among others, extract as much as 1.1 cms of groundwater—slightly higher than what BCWD pumps—with their own deep well pumps. Households in the city and vicinity, especially along the coastal area of Batangas City, also draw groundwater from shallow wells.

In response to concerns raised on the excessive pumping of groundwater in the coastal areas and on the potential problems of saltwater intrusion of the groundwater aquifer and land subsidence, the city government issued an ordinance requiring all heavy industries, located mostly along the coastal areas, to use treated seawater (by constructing desalination plants) for their water requirements instead of pumping groundwater. The ordinance grants heavy industries five years to build their desalination plants unless an industry can justify why such a desalination plant is not needed. Within this period, the affected industries may explore other water sources to avoid constructing a desalination plant.

Deep well pumping versus shallow water pumping along the coast

In the past five years, the salination (seawater intrusion) of shallow well water supply of households along the coast has raised alarm. Households living along the coast of Batangas Bay blame the heavy industries for causing the salinization. The heavy industries claim that they pump groundwater from deep, confined aquifer which is not connected to the shallow aquifers. They also argue that the possible causes of salinization of the household water supplies are the overpumping of these shallow aquifers and possible reduction of groundwater recharge due to forest denudation or commercial and residential developments in the nearby areas. Households counter that along the coast, the shallow groundwater aquifer overlying the deep aquifer is connected by a leaky confining layer or aquitard so that overpumping of deep wells could reduce the freshwater pressure needed to repel seawater from intruding the shallow aquifer. Unfortunately, a scientific study to investigate the groundwater problem in this area has not been conducted yet.

Heavy industries versus BCWD water usage

Both the heavy industries and the BCWD extract significant amounts of groundwater from the same regional deep, confined aquifer. As such, both should be responsible for seawater intrusion. The BCWD, however, is silent on this issue and is apparently not perceived as part of the problem. Only the heavy industries are embroiled in this conflict with shallow groundwater users.

Assessment of groundwater resources

To date, there is yet no comprehensive groundwater quantity and quality study with water demand projection to evaluate the available and future groundwater resource in Batangas City and the vicinity. A groundwater study provides an inventory of the quantity and quality in time and space. Groundwater monitoring for one or two periods would be needed to calibrate the groundwater model. Perhaps other sources of water such as surface water can be used in addition to groundwater resource instead of requiring desalination plants, which are very costly.

The observed denudation of the forest area in the upper watersheds that is believed to have reduced groundwater recharge and subsequently reduced groundwater safe yield should also be addressed. Sosa (2002) suggests that a comprehensive basin-wide water resources assessment be considered to a) determine the existing and potential alternative sources of water supply as well as the present projected future demands for various sectoral uses, and b) get a complete picture of water supply-demand situations for various socioeconomic development scenarios in the basin.

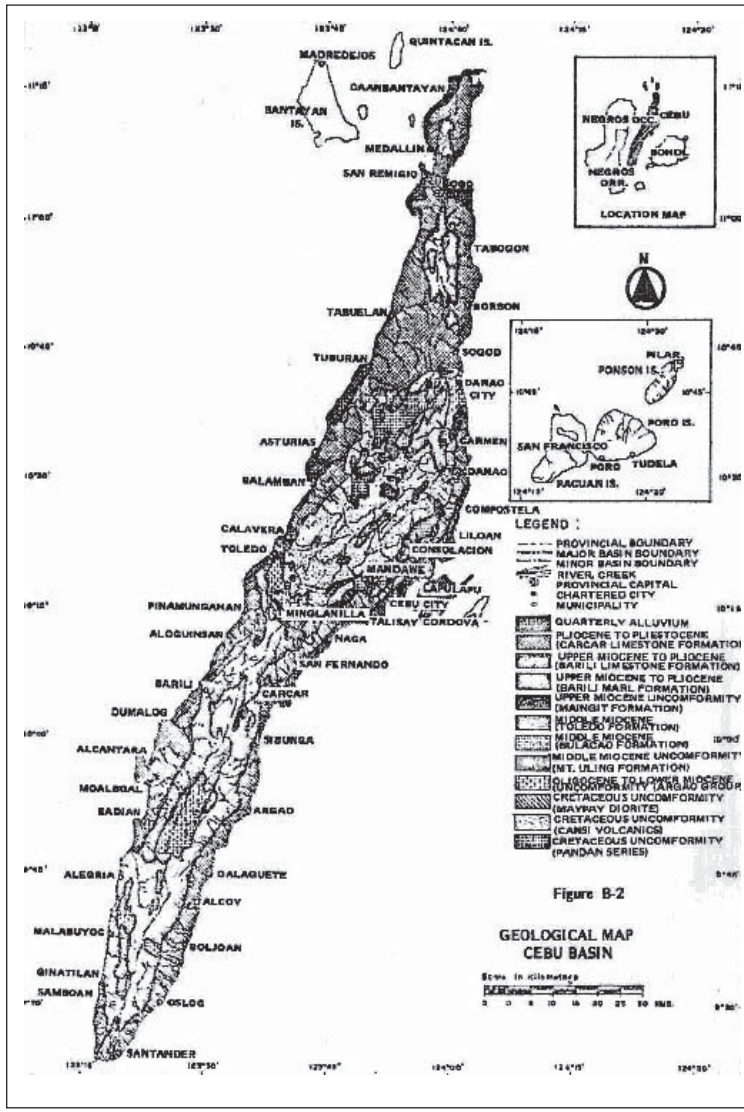
Cebu City groundwater system

Physical system

The groundwater system of Cebu City covers an area of about 180 sq km stretching to about 30 km long from north to south and about 5 to 8 km wide (Figure 5). The aquifer is mainly composed of Carcar limestone, which is coralline in nature and is characterized as very porous, especially with the presence of large cavernous channels (Walag 1997). The aquifer, no more than 500 meters thick, sits on top of the bedrock of Cebu Island. Near the coast, the limestone is overlain by fine deposits of alluvial materials with thickness of 10 to 20 meters. The eastern portion of the groundwater aquifer is hydraulically connected to the ocean, thus its susceptibility to seawater intrusion.

The annual average rainfall in the coastal area of Cebu is about 1.6 m a year. Thirty percent of this amount is assumed to percolate into the groundwater aquifer. Based on the amount of percolated water multiplied by the aquifer area of 180 sq kms, the groundwater recharge is about 86.4 million cubic meters (mcm) a year (Scholze et al. 2002). A more conservative estimate of groundwater recharge given by Clemente et al. (2001) is 54.7 mcm a year.

Figure 5. Cebu basin geologic map



Multiple groundwater users

The water supply of Metro Cebu is mainly derived from this groundwater system. The major groundwater users are the Metropolitan Cebu Water District (MCWD), big industries, and private as well as government wells. It is estimated that MCWD annually pumps as much as 36.5 mcm (an

average of 1.15 cms) and the other users (mostly private) as much as 46.7 mcm per year (or an average of 1.48 cms). The total annual groundwater extraction is therefore about 83.2 mcm, which is almost equal to the annual groundwater recharge of 86.4 mcm. This extraction rate, however, is well above the conservative estimate of 54.7 mcm of Clemente et al. (2001), which may be considered as the safe yield value of the groundwater aquifer.

Seawater intrusion of Metro Cebu groundwater aquifer

In the last two decades, Cebu City has undergone considerable urbanization and industrialization, resulting in an enormous increase of groundwater extraction. Apparently, the groundwater pumping rates exceed the safe yield of the aquifer resulting in seawater intrusion into the aquifer. This condition was initially observed by Engelen (1975) and later by Walag (1984). Such excessive pumping has also resulted in the lowering of the groundwater piezometric levels, thereby requiring higher pumping lift (energy) to extract groundwater. It may be noted that the Cebu City groundwater aquifer is so vulnerable to seawater intrusion because of its Carcar limestone formation, which is very porous. This is aggravated by the presence of cavernous channels that virtually serve as pipes to convey saltwater unless the freshwater pressure is strong enough to repel the seawater pressure.

Regulation of groundwater use

The MCWD has been deputized by the NWRB to regulate the groundwater usage in Metro Cebu. Over 20,000 groundwater wells are registered with the NWRB (Walag 1997). To ensure that the groundwater usage is within the safe yield of the aquifer, the MCWD monitors usage by metering and recording the production of these wells. Unfortunately, the MCWD does not have the budget to do groundwater monitoring, thus, there is no way to regulate or control groundwater usage. Efforts to arrest further intrusion of seawater inland are futile without control and regulation measures.

Another regulation issue is the apparent conflict of interest between the MCWD as a water distributor, on one hand, and as a regulator, on the other. Based on a Presidential executive order issued in September 2002, however, the MCWD will be stripped off its regulatory functions in Metro Cebu, because NWRB has already been reconstituted into a board with

members independent from direct claimants to water resources. Thus, the latter may take on this regulatory function.

Need for groundwater management model study

As recently as March 2002, a research project has been proposed by Sholze et al. (2002) to develop a groundwater flow and salinity model that will simulate the saltwater intrusion phenomenon of the Metro Cebu aquifer. Specifically, under various scenarios of water consumption and groundwater extraction rates, management strategies will be formulated to protect the groundwater resource of Metro Cebu, using the groundwater simulation model. But even if skillful management policies are developed, the big question regarding who will and what it will take to implement such policies in the context of groundwater usage monitoring and control remains. By charging the right price or fees for groundwater use rather than allow it as a free good, the government could have generated revenues that can be used to develop the technical capability of people and provide legal support for the management and protection of Metro Cebu's groundwater resources.

Conclusions and recommendations

Angat Reservoir

The Angat Reservoir is a multipurpose reservoir dedicated for the following purposes: 1) domestic water supply for Metro Manila under MWSS regulation; 2) irrigation water for rice and crop production in Bulacan served by NIA; 3) hydropower generation by the NPC; and 4) flood mitigation to protect the area downstream of the Angat dam site. For Metro Manila, in particular, the Angat Reservoir is a very vital source of water since it serves almost 65 percent of the city's population. Due to population growth and the resulting increased demand for domestic water supply in Metro Manila, domestic water demand will inevitably compete against the irrigation water needs of Bulacan. Considering Metro Manila's economic importance and political clout, this can be a source of conflict between Metro Manila water users (or MWSS) and Bulacan farmers (or NIA).

As earlier noted, changes in the water allocations of the Angat Reservoir in the past tended to increase the domestic water supply allocation for MWSS, thus reducing the irrigation water allocation of NIA. An un-

derlying issue here is the compensation of Bulacan farmers such as the case in 1997 when they sold their water allocations for Metro Manila domestic water supply but were never compensated for their foregone income. Their claims are still being debated by NIA and MWSS (Pascua and Payawal 2002).

On the supply side of the issue, one can increase the reliability of the Angat Reservoir to satisfy water demands with reservoir operations that employ reservoir-hedging rules with forecasted inflows and dynamic optimization. Metro Manila nonetheless should not solely depend on Angat Reservoir for its water needs. It should seriously consider alternative sources of water sooner than later such as the Laiban Dam.

Laguna Lake system

The Laguna Lake system is a multipurpose resource system used for flood control, fisheries, domestic water supply, hydropower generation, and navigation. A major concern revolving around the lake is how to maintain its salinity levels, especially the western portion, for fish production and aquaculture in general. This is of course in conflict with the use of the lake for domestic water supply unless desalination water treatment cost becomes economically viable. Another relevant issue is the extent (in space and time periods) to which the lake may be used as a flood retention storage during the flood season to protect Metro Manila without posing any harm to the towns along the shores of Laguna Lake.

To address the issues of lake pollution and salinity, it would be useful to establish a continuous water quality data monitoring. Data collection in the past had been done on a project basis and sampling frequencies were conducted at irregular time intervals. Water quality data monitoring, especially if complemented with a predictive water quality or lake pollution model, will be useful in the surveillance, detection, and regulation of lake pollution.

Batangas City groundwater system

Batangas City and its vicinity sit on a common, regional deep, confined groundwater aquifer and parcels of shallow, unconfined aquifer. Two competing, large-volume users of groundwater supplies are present in the region, namely: 1) the BCWD that pumps from the deep, confined groundwater aquifer for domestic and commercial water use; and 2) the heavy

industries along the coast of Batangas Bay that also pump groundwater from the confined groundwater aquifer for their own industrial water uses. In addition, most water users such as domestic households in the city and vicinity, especially along the coastal areas, pump groundwater from the shallow, unconfined aquifer or wells.

Because of the prevailing situation, the households along the coast extracting groundwater from the shallow, unconfined aquifer have been experiencing saltwater intrusion problem. The big industries, especially those located along the coast, have been blamed for the saltwater intrusion problem due to their enormous groundwater extraction rates. To properly investigate these issues and concerns, however, the authorities concerned should conduct a comprehensive groundwater quantity and quality study with future (projected) water demands to evaluate the available and future groundwater resource in Batangas City and vicinity, including its water quality situation. Based on such a study, efficient, and sustainable (safe) usage and management of available groundwater resources can be recommended, including the possibility of using other water sources simultaneously in the future.

Cebu City groundwater system

The main source of water supply of Metro Cebu for household, industrial and commercial users is its groundwater system. The MCWD as well as private firms and individuals have been excessively pumping groundwater from this source for almost 20 years now, causing seawater intrusion into the aquifer. This excessive groundwater withdrawal has also lowered the groundwater piezometric levels to alarming levels, resulting in land subsidence and higher cost of pumping water due to high-energy lift requirements.

Tasked by the NWRB to regulate and control groundwater usage to safe yields, MCWD has not been able to do its job. Unless this question of control and regulation is resolved, there is no way of solving the seawater intrusion and excessive drawdown problem of the Metro Cebu groundwater aquifer. An extensive monitoring of groundwater levels and withdrawal rates must be established in Metro Cebu and in tandem, a comprehensive groundwater model for flow and salinity transport must be developed for proper and efficient groundwater management of Metro Cebu's groundwater resource.

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6 Water allocation mechanisms and environmental service payments

Herminia A. Francisco

Introduction

"Water is life" is a cliché often heard in many discussions involving water issues. Trite as this phrase may sound, it adequately captures how important water is to everyone and what the repercussion is of ignoring this fact.

A United Nations report estimated that given the current rate of water consumption, a total of 2.7 billion people in the world will face severe water shortages by the year 2025 (Kijtiwatchakul 2002). The Asian Development Bank (ADB) fully concurs with this and has in fact put water issues at the forefront of development concerns. Another major player in the global efforts to address water scarcity, the World Bank, for its part, finances major projects that include infrastructures for dams, irrigation schemes, general water resource development, and electricity generation and distribution, among others.

These efforts to solve the water problem through improvements in water delivery and sanitation infrastructure, however, are not sufficient. As Jamie Pittock (2002) of the International Living Waters Programme pointed out, the water crisis faced by the world goes beyond providing sanitation and water infrastructure facilities. These solutions will not address the freshwater crisis that was primarily caused by poor management, specifically by the inability to conserve water resources and use water more efficiently. What is needed is an integrated water resource management system that considers the supply and demand aspects of the problem.

Toward this goal, two important considerations are deemed critical. On the supply side, there is the urgent need to consider the water resource as an ecological unit, more specifically embodied in a river basin or the watershed approach of resource management.[1] This call has been made in various chapters of this book, especially in Chapter 2. On the demand side, there is a need to view water as an economic commodity that must be managed—just like any other similarly scarce, economic resource.

This chapter addresses this demand-side aspect of water resource management. Specifically, it discusses what water allocation entails, why there is a need for it, and how water allocation decisions are made. It also looks into how allocation decisions can be improved through resource pricing and creation of water markets. It also talks about environmental service payments—a mechanism where benefits/rewards may be made by consumers of water to those who provide watershed protection services. This mechanism is meant to raise funds to support watershed protection efforts as well as to influence one's behavior in the consumption of water.

Water allocation: what it is and why the need for a rational allocation mechanism

Water, as shown in the previous chapter (Tabios and David), is a finite resource that has various competing uses. In many parts of the world, including the Philippines, the allocation of its use has, for a long time, been done with substantial involvement of government on the basis of social criteria and equity considerations—i.e., for human consumption, sanitation, and food production.[2] However, the growth in population and urbanization has led to more activities with increased demand for water, thereby making the issue of potential and actual scarcity of water a major concern in many countries.

In the Philippines, in particular, the increased population growth, improved lifestyle of people, and dwindling water supplies due to poor conditions of major water sources pose major threats to its water security situation, especially in most urban centers. As such, it becomes necessary to adopt a more rational basis for allocating water (the current basis is public allocation)—one where water will flow to its best and most effi-

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[1] The definition of river basins and watersheds is found in Chapters 1 and 2 of this volume.
[2] Dinar and Meinzen-Dick (1997).

cient use while at the same time ensuring a certain degree of protection for the impoverished sectors of society.

This entails a consideration of other mechanisms, or a combination thereof, for water allocation.

Water allocation mechanisms: concepts and features

Several water allocation mechanisms are currently being utilized in various countries and may be available for use in the Philippines. This section looks at four major mechanisms, their nature, and features as well as their advantages and disadvantages.

Public/administrative allocation

Public or administrative allocation is primarily geared toward satisfying societal goals such as equity. This mechanism is particularly used in water-deficient areas, where private investors' profit interest could not be met but where water demand by a significant group of people has to be satisfied. By its very nature, this mechanism is largely dominated or characterized by government involvement.

While government plays an important role in water allocation because of certain unique characteristics of water (i.e., its physical nature makes it hard to transport and it is a common pool resource that allows several users to benefit from its use), a major problem in the public allocation approach is that water is hardly treated as an economic good with its own scarcity value. Water under this approach is priced far below the costs of water supply provision and does not truly reflect its value to its users.

As such, the public sector-led mechanism fails to create incentives for the users and managers of the water resource. It also encourages wasteful use of water and leads to a shortage of funds to effect the necessary investments in water resource management.

In this regard, the public allocation mechanism by itself may not prove to be sustainable.

User-based allocation

Linked to some extent to the public allocation system is the user-based allocation mechanism which involves distribution decisions by institutional groups that are connected to the bigger, state-operated system. This

mechanism constitutes a form of decentralization of power by the central government and is one important step in getting the local people involved in the management of their water resources.

For instance, rights to irrigation systems along the distribution network may be granted to farmers associations, which may adopt their rules on how water is to be shared among the members based on a number of allocation rules. Rules for allocation may be through such systems as a) timed rotation, b) depth of water, c) area of land, and d) proportional shares to the flow (Yoder 1994).

A major advantage of the user-based allocation system is that this is more responsive to local needs, since water users are oftentimes closely involved in decisions involving water distribution, and in some cases, even management. The system could also allow for greater transparency in operations that make the system less vulnerable to influence by interest groups. One cited disadvantage to this system, however, is that it does not allow for intersectoral water allocation, since other sectors' interests in water use do not enter into the decisionmaking consideration of the user groups. In cases involving intersectoral allocation decisions, the State is still needed in the absence of water markets.

Allocation based on full-cost pricing (marginal opportunity cost pricing)

Theoretically, there are three major components of the marginal opportunity cost (MOC) pricing of water. These are: a) the marginal private cost (MPC) which corresponds to the direct cost of operating and maintaining the system and delivery of water to final consumers, b) the marginal environmental cost (MEC), which is the environmental cost associated with production/extraction and consumption activities connected with water use, and c) the marginal user cost (MUC) or the cost imposed on current water users for leaving behind less water to future generation.

In terms of water allocation across uses or sectors, the theoretical condition for efficient condition is one where the marginal value of water across uses is equal. Because different uses of water correspond to different MOCs and also to different marginal values of water, the market is then expected to move water where its value in use is highest. Optimality condition thus sets in once value in use across uses has been equalized.

The main problem with setting the price of water at the MOC level is how to define the MOC. Of the three components, the MPC is fairly straightforward to compute, but the estimations of MEC and MUC are wrought with difficulties. Spulber and Sabbaghi (1994) in Dinar et al. (1997) point out some difficulties with the MOC concept: a) the marginal cost is multidimensional in nature, with water quality and quantity dimensions; b) the marginal cost varies with the period when it is measured (short-run vs. long-run marginal cost); and c) implementing this system requires volumetric monitoring, which is very costly and difficult to administer. This approach has also been criticized for neglecting equity issues as the scheme may hurt the poor excessively during periods of scarcity when water prices are expected to rise.

Market allocation through water market rights

This allocation mechanism requires the creation of a tradable system for water rights. Such a system entails having a well-defined, measurable, and enforceable water rights, which sets the original allocation of water rights based on the allocation rules discussed earlier; creating the legal and institutional frameworks that shall govern the trading transactions; and investing on the basic necessary infrastructures to allow the transfer of water across buyers and sellers of water rights.

Once transactions happen among water rights holders through market transactions, it is expected that water will flow to the high-value uses in the various sectors. This system is expected to deter excessive water use, thus reducing certain environmental costs like water logging due to excessive use of irrigation water. Interestingly, the water markets system allows environmental groups to buy some of the water rights to pursue their goals.

In practice, however, water markets are found to work only when applied to a given water resource in a specific area, with a well-defined and measurable allocation of water rights. There are two levels of trading that could take place: a) one is the short-term or "spot market" trading involving the transfer of a given quantity of water rights for a given period of time; and the other is the b) long-term transfer of rights. Water markets involving short-term transactions are generally more popular than long-term transfer of rights.

There are other advantages to the water markets system (Rosegrant and Binswanger 1994). For one, the assignment of water rights to certain groups of users or individuals by itself is a positive development, as the more secure tenure status creates greater incentives to engage in improved conservation of the resource. For another, the system of tradable water rights allows water values to respond to changes in the profitability of the enterprise for which it is used. This kind of flexibility is not found in the public allocation of water, where prices are administratively determined.

However, there are also disadvantages to the system. One, the conditions that must be met for the water rights markets to work are not easy to put in place. Two, the system also requires water to be measured, sometimes with the quality dimension taken into account. This measurement effort is not easy to carry out, as this may require substantial investments for the needed conveyance infrastructure. Three, variation in water flows also makes measurement difficult. Finally, efforts to incorporate environmental effects (associated with increased use of water in pollution-intensive industries) in the price of water and the interests of the poorest of the poor may have to be considered inasmuch as the water markets may not address them automatically.

Water allocation in the Philippines

After looking at the various mechanisms available for the allocation of water, this paper examines the current method of allocating water for various uses in the Philippines. As mentioned earlier, public allocation is largely the basis for deciding the allocation of water uses in the country.

Public allocation exists in agriculture and hydropower sectors, particularly with respect to large irrigation and power generation projects. Here the State decides what water resources will be used by the system as a whole and how these are to be allocated and distributed to the different interest groups/consumers within the system. In the Philippines, political influence plays a big part in where these large investment projects are built, alongside basic considerations such as the importance of the area in the overall agricultural/power generation development of the country.

The government vests some control on the distribution of water for domestic use to private water supply corporations and water districts, and for agriculture to farmers' groups. These entities in turn allocate water to their various consumers and adopt a pricing scheme that is subject to

approval by the National Water Resources Board (NWRB). The government also controls the extraction of groundwater resources in the Philippines through the granting of permits. By design, this permitting system is expected to regulate water withdrawal and effluent discharge by individual companies and industries as well as by individual households. In practice, however, the one-time extraction fee system merely serves to raise revenue and is hardly used to regulate the level of extraction or the number of firms drawing water from the groundwater resource. The latter is particularly true for household connections, which are hardly monitored. Public allocation also applies to fisheries and navigation, particularly when there is a need to restrict water extraction or withdrawal beyond a defined critical water level. It is considered necessary in the provision of certain services such as flood control, watershed management, and environmental protection.

Hand in hand with the use of the public allocation approach in the Philippines is the users' allocation approach. This applies, for instance, where water distribution systems are managed by cooperatives for domestic use and by associations like farmers' associations for irrigation purposes in some areas in the country.

In terms of allocating water through a full-costing scheme, the current pricing scheme does not even cover the MPC on account of equity and other social considerations, as discussed earlier. There are recommendations, however, to review the pricing system of water in the country, taking into account its economic value while at the same time applying a tariff scheme that would include the equity consideration. Doing so, however, especially in terms of incorporating the three components of the marginal opportunity cost, may not be easy but should be tried anyway to improve efficiency in water use.

The current dominant practices in water allocation in the Philippines are therefore based on public and user allocation systems. Indeed, the role of the government is deemed important and should continue in the allocation of water, especially in light of the need to ensure that the disadvantaged groups' requirements are met. However, because of the wasteful consumption that this system inadvertently spawns, the growing scarcity of water, and the high cost of sourcing new water supplies, the call for market-based mechanisms that lead to more efficient water allocation is gaining ground.

In general, of course, a combination of the water allocation mechanisms described above can coexist in the country. For equity consideration, the public allocation mechanism must continue to play a big role. At the same time, more efficiency in water allocation must be established.

How efficiency in water allocation can be achieved and/or improved is the focus of the next section.

Improving water allocation efficiency

There are several ways to recognize the value of water in allocation decisions. One, the general subsidy on water price must be removed. David and Inocencio (1996) have shown that such a subsidy benefits the rich more than the poor. Hence, proper targeting to benefit the poor must be carried out instead of the general water price subsidy. Subsequently, the price of water should be set based on the full-cost pricing principle. This entails reflecting the marginal cost of extraction, delivery and operation, and the environmental costs and user costs of water extraction and consumption.

Across competing water uses, the efficiency condition further requires that the marginal benefit from the use of the resource is equal across all sectors. Such equality leads to maximum social welfare, since there is no other reallocation that can yield higher benefits to society. Admittedly, however, setting the price at the marginal opportunity cost level is expected to encounter stiff resistance, politically and socially, due to equity considerations. Still, this is a risk worth taking if the government is keen on increasing efficiency in resource use.

Any plan, however, to increase the price of water must be accompanied by an improvement in water services. Without this improvement, any price increase will be difficult to justify.

The other alternative is to set water markets that will allow water rights to be traded. This system has been found effective in countries like Brazil, Spain, and Colorado in the United States. Marino and Kemper (1999) analyzed the institutional frameworks of successful water markets in these countries and found that the following were critical to their success: a) existence of a well-defined system of water rights, b) adoption of user-based management approach, which allows for accountability and transparency in the transactions, c) presence of an institution in the market that provides information and transaction mechanisms to facilitate

transferability of rights, and d) use of a mechanism that takes care of third-part effects associated with the transfer of water rights.

In view of the above, efforts to study how this may be effected in the Philippines should be exerted. The presence of a water rights market, where trading of rights may be made, is valuable in dealing with cases like the one that took place during the 1997 El Niño phenomenon, when water allocation from the Angat Reservoir had to be prioritized (see Chapter 5 by Tabios and David, this volume).

In addition, there is now an increasing clamor to use environmental service payments as well to encourage investment in watershed protection. The basic rationale is that there is underprovision of environmental services, because those who perform these services are unable to appropriate benefits from their action.

In particular, the concern is for the upland communities whose land use practices generate social benefits that exceed private benefits. Since there is inequality between social benefits and private benefits, provision of environmental services is believed to be unsustainable in the long run. There is therefore a need to narrow the difference between private and social gains.

To do so, one would need to collect water payments from those who benefit from the environmental services. To implement this scheme, however, one must have valuation studies on the pricing modes for water. Institutional analyses on how beneficiaries of environmental services can be charged and how providers of said services can be compensated should likewise be done.

Environmental service payments for watershed protection: sources of funds and consumption behavior influence

Linked with the discussion of demand management for water albeit equally related to the management of water resource supply—the watershed—is the concept of environmental service payments (ESP).

As mentioned earlier, this concept has been gaining ground as a mechanism to enable rewards (or payments) to be made to those entities providing environmental services, in particular upland farmers, whose efforts to protect the watershed, for example, have benefited society but who have not been compensated for said services. This nonpayment leads to the nonsustainability of said environmental services because of the

shortage of funds to support them. This in turn results in the underprovision of such services.

The challenge, therefore, is to collect fees from the beneficiaries of such environmental services and to channel such fees to those who provide the services to create incentives for sustained or higher level of environmental service provision.

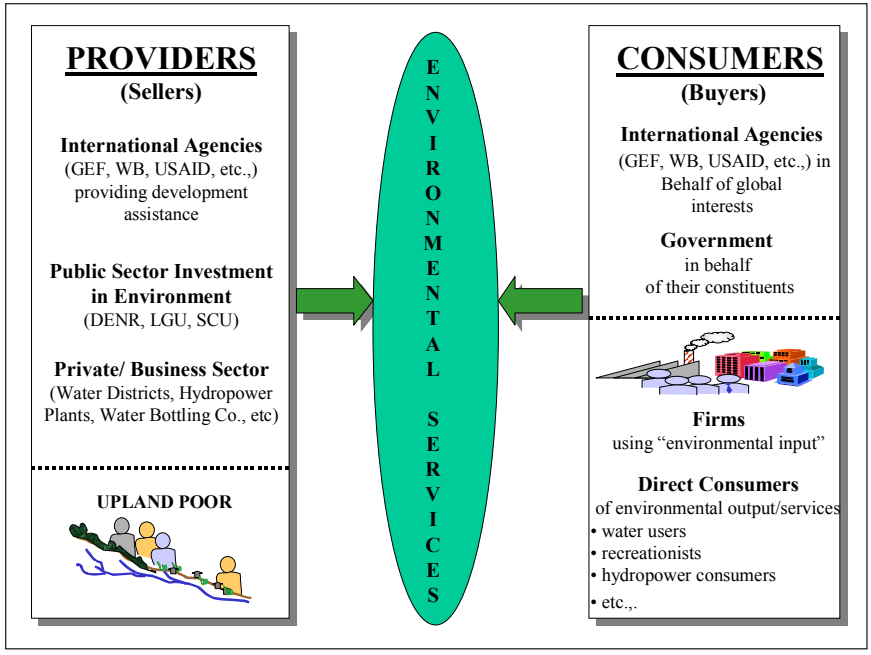
One must note, however, that the pricing of watershed resources should be done not so much to raise revenue as to change behavior. If water consumers will be made to pay the true cost of making this water available to them, then water use will be regulated and made more efficient. If farmers will be made to pay for the true price of irrigation water, then excessive water use and consequent problems of water logging will be avoided.

In addition, since watershed protection is an input to the "production" of quality and adequate water flow, then such service must be paid. Those who benefit from the service justifiably must be asked to pay for this service.

Figure 1 presents a schematic presentation of the actors (i.e., buyers and sellers) involved in environment service provision. It also shows that "payments" or rewards to upland farmers can be broadly classified into public provision (for assistance provided by the government, usually as part of the development assistance packages); and support given by non-government organizations (NGOs), international organizations, and even business firms, usually packaged through upland development projects or pro-poor initiatives. Payments in turn are made by the direct beneficiaries of the environmental service, such as water users through water districts, hydroelectric firms, fisher folks, industries, among others.

As shown, the implementation of Environmental Service Payments entails some form of payment—either in kind or in cash. This means that there must be buyers and sellers of environmental services. The buyers are those who benefit from the environmental service while the sellers are those who undertake land use investments that generate the environmental services. Since the watershed produces multiple benefits to many consumers, both domestically and globally, then there are several potential sources of payments. Some of these are discussed below.

Figure 1. Buyers and sellers of environmental services



Water utility revenues for watershed protection

With urbanization comes a rising demand for water and increasing problems associated with its use. The range of problems includes poor water quality, irregular water service, high level of water wastage due to damaged piped system, and high pilferage from illegal connections. The usual response to said problems is one of reliance on foreign loans for improved maintenance and operations and investments in water supply rehabilitation and expansion projects. However, these solutions are often inadequate. There is generally very little being done to protect the sources of water. Watersheds of these urban water supplies are often subjected to improper land uses and human encroachment as discussed earlier and in Chapter 2 (this volume).

As a result, the urban populace is threatened with poor water quality and seasonal water shortages. These conditions are enough reasons for urban water users (and, for that matter, all users of water "produced" by

the watershed) to pay for watershed protection efforts as part of their water bills.

Greater awareness of the link between watershed protection and water supply could convince the beneficiaries of watershed protection to pay the needed amount. Efforts to enhance such awareness must be exerted through information, education, and communication programs.

If water consumers are targeted to provide payments for watershed protection, then the cooperation of water districts or water providers must be sought. This is needed since these agencies are tasked to collect water bills.

In the case of the Maasin watershed in Iloilo City, for instance, the water district charged such environmental service payments from its revenues. Initially, the payments were given to the DENR and then to the local government.

Unfortunately, the absence of transparency in the utilization of such funds and the perceived lack of link between such payments to watershed protection did not make this payment sustainable. Efforts to improve the administration of such funds are thus needed. The fact, though, that the Local Government Code mandates the collection of this payment makes such efforts worth all the more undertaking.

Other sources of funds for watershed protection: some examples

Other possible sources of funds that may constitute ESPs include a percentage of hydroelectric generation revenue that power firms are mandated by law to give back to the community.

This source was tapped for watershed management and conservation in Colombia, where an arrangement was negotiated between Energia Global, a private electricity provider (Chomitz et al. 1998), and landowners in two watersheds. This company operates two small (15 megawatts each) runoff-the-river hydroelectric facilities, supported by two watersheds covering 2,377 and 3429 ha. The company has offered landowners in the two watersheds $10 for every hectare per year to maintain or restore forest cover in their plots, with the payments coursed through the agency in charge of watershed protection.

The same scheme was adopted in Costa Rica, particularly in the La Esperanza watershed, where a contract was forged between the La Esperanza Hydropower Plant and the Monteverde Conservation League

in 1998. The latter is an NGO that owns most of the watershed's upper catchment. The agreement stipulates the payment of $3 to $10 per hectare per year for the first five years and $10 per hectare per year from the fifth year onwards. This contract applied to 3,000 ha, which represent 88 percent of the total area with the contract valid for 99 years.

Costa Rica is fairly advanced in terms of effecting environmental service payments for forest resources. In 1996, the New Forestry Law was passed, which provides the basis for charging environmental service payments. Specifically, this law recognizes the role of the forest in increasing water availability and quality, flood control, and sediment control. As such, it assigned the National Forest Office and created the National Fund for Forest Financing (FONAFIFO) to develop modalities for the payments of environmental services at the local level. The sources of payments are the fuel tax on gasoline use, carbon offsets, and fines collected by the Ministry of Energy and Natural Resources. The FONAFIFO is tasked to determine each year how much to pay per hectare of forest planted and managed as well as how much area to cover yearly. The long-term vision is to determine how water prices can be reformed to integrate the cost of conservation of the water source.

The voluntary contributions made by the Associations of Agricultural Water Users in the case of the Cauca River watershed is another example of how to raise fees for watershed protection. (See Francisco, Chapter 2 of this volume.) The same scheme was adopted in Zamboanga, Philippines, where an association of fisher folk had voluntarily offered to sell their harvest at reduced prices to members of the upland farmers' organization after observing an improvement in their catch after a few years of reforestation activities by the upland farmers.

Conclusion

The objectives of water resources policy generally revolve around equity, efficiency, and environmental protection. In developing countries like the Philippines, equity concern has been (and still is) the dominant driving force in drawing the country's water policy. This has been justified on account of the public good characteristics of water resources, the large investment required in water infrastructure, and the need to provide for the basic requirements of people in water-scarce regions. However, the wasteful use of resources, the rising cost of accessing water from new

sources, and the poor performance of publicly run water utilities have led to clamors for greater attention to efficiency and environmental protection concerns.

The need to allocate water across competing uses is a real need in water-scarce regions. Allocation mechanisms can range from complete control by the government at one end of the spectrum to complete reliance on markets (tradable water rights) at the other end. In between is the user-based allocation which entails the decentralization of control by the government to organized groups of water users and then the setting of prices that closely approximates the true opportunity cost of the use of water.

As indicated in the previous sections, there will always be a role for public provision but it is becoming increasingly desirable to rely on markets, if the government is truly committed to addressing efficiency concerns in its water policy.

Reliance on markets, however, demands that the supporting legal and institutional framework be put in place. It also requires investment in supporting infrastructure to effect water transfers and to allow for measurement of water usage and "ownership." These conditions are not easy to meet and thus entail real commitment by the government.

In the Philippines, the dominant practices in water allocation are through public and user-based allocation systems. Experience shows that devolution of control in some areas to locally based user groups of water (e.g., irrigators associations) has been successful, based on improved delivery of water services and better maintenance of the water system. Admittedly, however, success of these user groups varies in different places.

While efforts to price water more appropriately to reflect its marginal opportunity cost are already underway, progress along this line has not been achieved. Legislative measures to support raw water pricing and to decentralize pricing of water resources are still needed. The establishment of water rights markets will theoretically lead to the most efficient allocation of water and should be established wherever and whenever it is found feasible. The Angat Reservoir is one such site for the implementation of this system.

In general, however, these various allocation mechanisms can coexist in the Philippines. To be sure, there is a role for public allocation,

particularly in developing countries where the interest of the disadvantaged groups has to be met. Government's role is also important in cases where the substantial investment in water delivery and sanitary infrastructure poses a major constraint to private investment. Where market allocation is found to have strong advantages, however, it is in society's interest to make this system work.

Finally, the need to price watershed protection as an input in the "production" of water cannot be emphasized enough. Such a price must be paid by those who benefit from the service of having water at the right quantity and quality. As shown in the discussion, there are various ways to raise revenues to generate funds for watershed protection and management. Obtaining broader support for the collection of environmental service payments, however, requires strong political support, as demonstrated in Costa Rica, where an agency, fully supported by legislation and with corresponding budget allocations, was created specifically to handle environmental service payments.

Payments for watershed protection could form part of the water or electric bill. Such protection happens to be one of the environmental services being provided by upland farmers, who deserve to be compensated.

All of these measures, once implemented, should lead to an efficient integrated water resource management in the country.

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7 Interactions between economic policies and institutions in water allocation and use: theory and evidence from a Philippine watershed

Ian Coxhead *

Introduction

While the Philippines' current water policy recognizes the relevance and importance of a watershed-based approach to water resources management, the lack of the necessary elements for this policy to work has resulted in more watershed degradation, especially in the era of rapid economic development. Water resource planners need access to watershed level data that establish water resources supply and demand factors. The necessary information set consists not only of hydrological and related biophysical data but also of the economic and institutional framework within which water use decisions are made. The range of feasible policy instruments for water management, and their likely effects, are conditioned by combinations of these factors. The presence of policies, especially those targeting agricultural development, contributes an additional layer of complexity, since these can distort private incentives concerning the use of water, land, and other resources. On top of all these, households in upper watershed areas, where water management policy must begin, are among the poorest in the country. This means that watershed management policy cannot be made independently of broader concerns regarding the alleviation of poverty and reduction of inequality.

To understand these issues at the broadest level, one must have a simplified analytical framework. To be useful, this should not attempt to

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capture all the complexity of water policy, but rather serve as a tool for putting issues in perspective and thinking about them systematically.

This chapter begins by presenting such a highly simplified model (section 1) wherein what is distinguished are only the decisions of two agents, in upstream and downstream locations, who compete for a limited supply of surface water in each period. There is no attempt to provide a complete accounting for the complexities of such situations; rather, simplifications are adopted which bring the role of economic incentives into sharp focus. In particular, market and nonmarket allocations of water are compared. Nonmarket allocations are further subdivided into those arising from a complete absence of property rights and those from the assertion of rights by the state.

A particular goal in this chapter is to uncover the likely water allocation effects of government policies that are not necessarily aimed at watershed management. Important examples of these in the Philippines include trade and agricultural pricing policies. These have the potential to alter incentives to use land and water in particular ways.

The next section explores such policies in the Philippines. Subsequently, the succeeding section provides a brief illustration by reference to data, analysis, and related experience from one Philippine watershed. This case study is useful not merely because the site is representative of many upland Philippine areas, but also because for almost a decade, it has been the focus of intensive data gathering, analysis, and various development initiatives at farm, community, project, and local government levels.

The evidence from the municipality under study provides emphatic support for two arguments. First, the natural resource base of the watershed is undergoing degradation with potentially serious consequences, especially for water quantity and quality. Second, much, if not most, of the degradation can be attributed directly or indirectly to the spread of intensive agricultural systems based on corn and vegetables, without the concurrent adoption of appropriate measures for the prevention of soil erosion and land quality deterioration. This spread is attributable in large part to agricultural price policies adopted by the Philippine government at a national level, in conjunction with an absence of effective property rights, either by private agents or the state, over water in upper watershed areas. Altering these policies and institutions can have important effects

on the valuation and allocation of surface water resources, as to be shown in this chapter. Coordinated reform of both policies and institutions is thus necessary to ensure sustainable use of water resources.

Ursula and Danilo meet Coase and Hobbes: the simple economics of water ownership, valuation and allocation

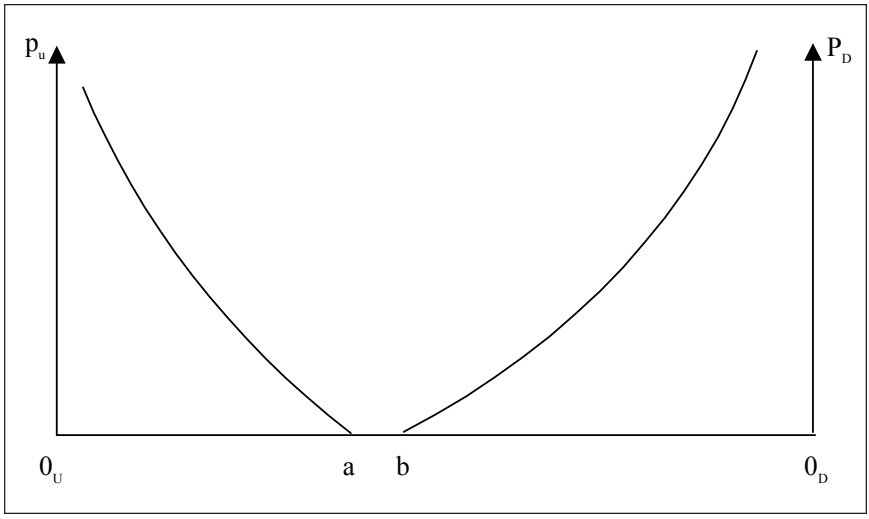
Water management strategies must try to balance all the complexities of hydrology, chemistry, economics, politics and institutions. This requires, as a foundation, a firm understanding of how agents interact when competing for water. This section explores the allocation of water between agents when property rights do not exist or are not enforced. For this purpose, a number of strong simplifications to expose the basic economic relationships and identify criteria for the design of policy are hereby adopted.

The model

Assume a watershed with two farmers. Ursula lives and farms upstream while Danilo does so downstream. Each farmer produces crops using land, labor and water. Assume for now that this is the only use for water (of course, the exposition can easily include each farm household's nonagricultural water consumption needs, but this will only make the model more complicated without necessarily generating any additional insights). The quantity of water each would like to use is determined by how much land each wants to irrigate, and what types of crops each one grows.

Figure 1 shows the basic model. The width of the figure, measured as the horizontal distance from 0_U to 0_D, represents the supply of water in each period (e.g., each day or each season), which, for simplicity, is assumed to be fixed. The quantity demanded by Ursula is measured from left to right in the figure while that by Danilo is measured from right to left. For each user, the relationship between quantity and price is shown by a marginal benefit (MB) curve, which records the value of water, shown on the vertical axes as P_U and P_D, to each user, at each quantity used. The downward slope of each curve indicates that the more water is used, the less is the value of an additional unit supplied to the user. If very little water is available, it is very valuable; if water is abundant, the value of additional supplies can approach zero—or even become negative, as when flooding causes damage to crops and property.

Figure 1. Abundant water supply in each period, unlimited consumption by both users



Property rights, demand and valuation

Abundant supply and unlimited demand

Initially, farming is relatively small and there is abundant water for all. When water is abundant, each farmer uses it until the marginal benefit of an additional liter is zero, i.e., where his or her marginal benefit curve crosses the horizontal axis. This is the situation shown in Figure 1. As long as the total quantity jointly demanded, $0_U a + 0_D b$, is less than total supply $0_U 0_D$, the implied value of water to each farmer is zero. If there were a water market, each would be willing to pay nothing for additional water.

Demand growth and competition for water

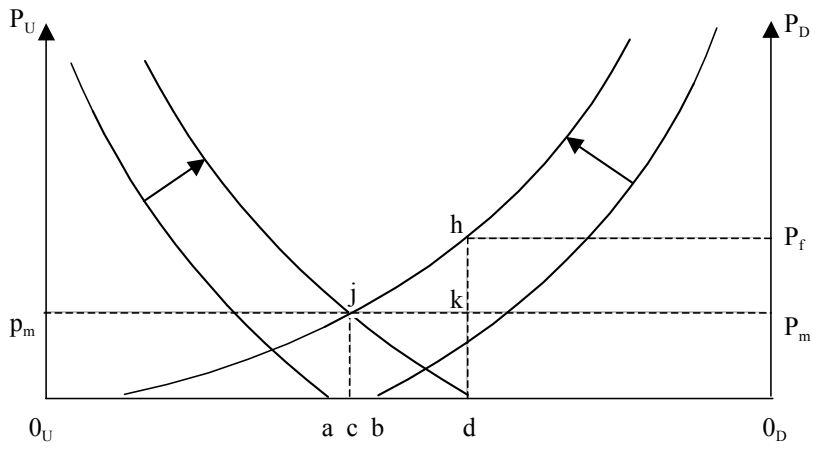
Over time, the activities of Ursula and Danilo expand (this may be taken as a metaphor for the growth of population and/or farming activities in the upper and lower parts of a watershed), and their water demands also grow. Eventually, with given supply, there is insufficient water to satisfy both sets of demands at a zero price. There is now competition (and potentially, conflict) over water, and issues of ownership, pricing, and water management policy become important.

Figure 2 illustrates some of these issues. Demand by both users has increased, shifting each marginal benefit curve toward the center of the figure. Imagine now that Ursula can take advantage of her location to capture water before it reaches Danilo. If there are no property rights to water, Ursula can use all she likes, and indeed will do so unless restrained by some policy or other action. This will result in Ursula using the quantity $0_U d$. Since total supply is fixed, Danilo can now consume only $0_D d$. This allocation results in a marginal value of water to Ursula of zero, and to Danilo of a positive amount, P_f, as may be read from the right-hand axis. Danilo is willing to pay up to this price per unit to acquire additional water.

One solution to Danilo's problem is for him to offer to pay Ursula to use less water. Bargaining between the two over price and quantity alone will result (in a perfect world) in an agreement in which Ursula consumes $0_U c$ and Danilo $0_D c$, with Danilo paying Ursula P_m per unit to purchase the quantity cd.

At this point, three important observations about the valuation and allocation of water between users can be made.

Figure 2. Demand growth with and without property rights and a water market



If water rights are tradable, the equilibrium allocation is at *c*, with both users paying a common price P_m. If there is no market and no limitation on upstream users, they consume up to *d*. Downstream users are willing to pay up to P_f but are quantity-rationed.

First, the allocation at *c* is *efficient* from an economic point of view. All the available water is used, and each farmer values it equally at the margin. Both farmers are better off because of the trade. Danilo has acquired a quantity of water delivering total benefits equal to the new area under his demand curve, *hdcj*, at the cost of *kcdj*—a gain of *hkj*. Ursula has sold water that she valued at *dcj* for the amount *hdcj*, a gain of *kdj*. The economy as a whole is made better off by the sums of these gains, *hdj*, and under any different allocation, one farmer could be better off only at the expense of the other's welfare. (Of course, this says nothing about the *biological* characteristics of the allocation; long-term sustainability may require that both farmers reduce their consumption in each period.)

Second, in this scenario, Danilo, who has no property rights to the water by virtue of his location in the watershed, is able to compensate by purchasing it. That an efficient allocation can be achieved regardless of the distribution of ownership rights is an illustration of the famous Coase theorem: when agents can bargain freely over a resource without transaction costs, the allocation of the resource will be the same, regardless of who owns it.

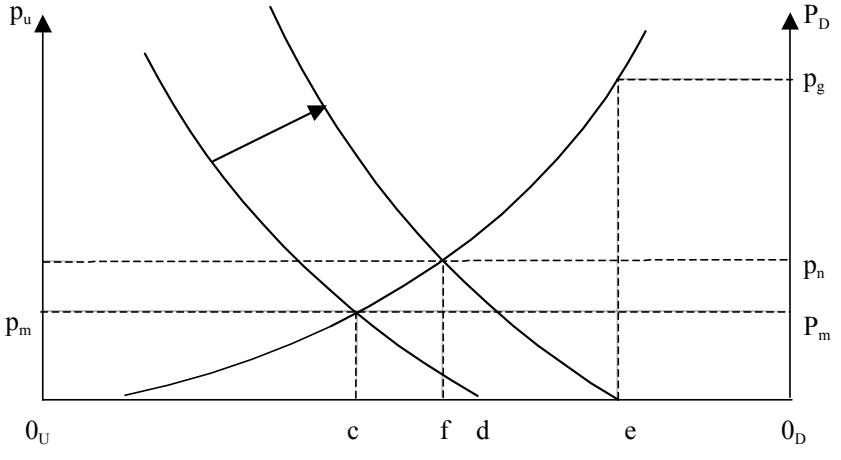
Third, in this ideal market transaction, Ursula receives a financial reward for adopting less water-intensive practices. Where upper-watershed communities are poorer than others, the market provides a means to reward them for conserving resources, as discussed below.

Effects of an output price change

The value of water to each user depends on the value of the goods that each farmer produces. Water demand is *derived* from production of these goods, and depends on the technology used, prices of other inputs such as labor, and the price of the output produced. If the output price increases, so does demand for water as an input to production, and thus the valuation of water by producers will rise.

Suppose, for example, that Ursula uses water to irrigate a vegetable crop while Danilo uses it to irrigate rice (or, for that matter, to produce hydroelectric power or to feed a municipal water supply system). If the price of vegetables goes up, Ursula will expand production, and in doing so increase her demand for water. Figure 3 shows that without a market solution, Danilo will then receive a lower water ration of 0_De relative to

Figure 3. Effects of a price increase for Upstream's product



If there is no market, Upstream consumes up to *e*. Downstream is then quantity-rationed and willing to pay up to p_g. Alternatively, if they can trade water, the equilibrium allocation is *f* with common price p_n.

the former ration, $0_D d$. Alternatively, with Coasian bargaining, Danilo will have to pay a higher price, p_n, to obtain desired water supplies. At this price, Danilo will demand only $0_D f$, implying a reduction in his farm production. The converse case—an increase in the price of Danilo's product, which also results in his paying more for water—can easily be inferred from the figure.

One important implication of the relative price change story just told is that in an open economy, where goods and services produced using water are traded with other nations, the prices of those goods have an important influence on the price (whether market or implied) of water used to produce them. World market shocks, translated into changes in domestic prices, affect the value of water to users. By extension, any domestic *policy* that affects goods' prices also affects the price and the allocation of water—even if the policy does not target water management directly.

Externalities and corrective measures

The relationship between Ursula and Danilo is not limited to conflict or bargaining over allocations. Ursula's activities may also result in water

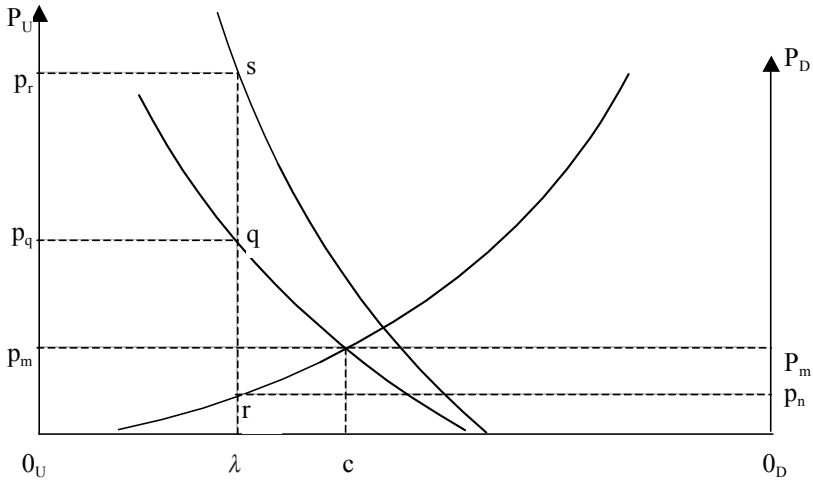
quality degradation, for example, through the runoff of eroded soil or agricultural chemicals. In this case, Danilo will incur additional costs associated with the need to purify water, remove silt from irrigation canals or behind dams, replace damaged turbines, and so on. These costs reduce Danilo's profits. As with the water allocation story, there is in principle a market solution to this problem, in which Danilo pays Ursula to reduce pollution. In practice, however, transaction costs are so high that such private deals are virtually never observed, and given that the pollution reduces not only private profits but also social welfare, government has a mandate to intervene.

If Ursula's water use or farm practices are polluting, then from society's point of view, the marginal benefits of her water use are lower than the private benefits that the demand curve represents. Her socially optimal use of water is less than her actual use. Government can act on this either through quantity controls (restricting Ursula's use of water directly through some rationing system), or through market-based instruments, such as a tax on water used in polluting activities.

In practical terms, however, it may be impossible for a regulatory agency to identify polluters when there are many upstream firms in this chapter's simple analysis. For this reason (known as the "nonpoint source pollution problem"), among others, a tax on water use may not be feasible. The pollution tax might instead be approximated by a tax on the use of another input (such as land), or on production or sales. This is the principle behind many existing environmental taxes when monitoring of individual polluters is not feasible—such as gasoline and other emissions taxes. Of course, not all forms of water pollution are untraceable to their source. Silt loadings from many small farms are virtually impossible to trace, but chemical or fecal contamination from production processes associated with a few large facilities (such as breeder farms or monocrop commercial plantations) may be much easier to identify. In this case, more specific policies can be designed.

Finally, as seen above, water values to users are affected by policies, including those policies that do not target water management directly. It is also the case that economic policies, when they change, alter the effects of "command and control" water management instruments. Consider Figure 4, which shows the effect of one kind of water management policy—a quota on Ursula's water use—under different output price

Figure 4. Command and control policies on water use



Upstream faces a quota restriction on water use at λ. At this quantity Upstream is willing to pay p_q, while Downstream values water at only p_n. An increase in the price of Upstream's output, resulting in a higher water demand curve, increases the difference in marginal valuations.

policy regimes. The quota limits Ursula's water use at λ. This measure, if effective, successfully restricts water use, but in doing so simply transfers property rights over the quantity $0_D\lambda$ to Danilo, who values this water at p_n; Ursula values her quota-restricted allocation at p_q per unit. Differences in the implied prices to users are indicators of inefficiency and aggregate welfare loss relative to the benchmark Coasian case, as shown.

Consider now what happens when a separate policy increases the price of Ursula's output. Ursula's water demand curve shifts outward, and with the same quota restriction, her willingness to pay for water increases to p_s. The extent of inefficiency, as indicated by differences in implied user prices, increases. It is also a predictable outcome that the cost of enforcing the quota effectively will increase, given the rise in Ursula's incentives to acquire a greater supply. Ursula will now have a greater incentive to cheat, given the opportunity. This simple illustration (there are many other possible forms of intervention) highlights the potential for policies to interact, and in doing so, to affect incentives and

welfare outcomes. Policy coordination across agencies is necessary though for efficient water resource management.

Supply shocks

Deforestation and loss of watershed function

Up to this point, the discussions have focused mainly on allocation mechanisms. However, one should note that the effects of water use and production on supply are equally important. The subsequent discussions, therefore, will touch on this.

In the diagrams previously shown, total supply per period (represented by the width of the horizontal axis) may change in response to upstream land use decisions. Deforestation, land clearing, and land degradation in upper watershed areas all reduce absorptive capacity, increasing the probability of flash floods and mud slides, and in dry seasons, also the probability of reduced or zero stream flow. In the Philippines, floods and mud slides are frequent during heavy rain events in denuded upland areas, and are sometimes catastrophically associated with destruction of property and loss of life. In Central Vietnam, the removal of forest cover in the headwaters of relatively short, steep river systems to plant coffee and annual crops contributed to the occurrence of two consecutive "hundred-year" flooding disasters in the rainy seasons of 2000 and 2001.

The case of a slow but steady loss of watershed function due to deforestation and land degradation is equivalent to a horizontal compression of the water allocation diagram. In the absence of property rights, Danilo will be steadily deprived of water as the total supply decreases. Since in this scenario, Ursula always uses water until its marginal value is zero, the gap in valuations between Ursula and Danilo will grow over time, and conflict over water can be expected to intensify. A Coasian market solution, were it possible, would yield an efficient allocation with a price reflective of scarcity value; this price, however, could rise over time to such a level as to make Danilo's production unprofitable. As supply diminishes, the returns, in terms of efficient water allocation, to policies that address watershed protection also increase, even if there are no direct or severe on-site productivity losses for Ursula, where water is still apparently abundant, and even if the noncommercial value of forest removed from the headwaters (its contribution to carbon sequestration or biodiversity) is ignored. Loss of watershed function is like a form of

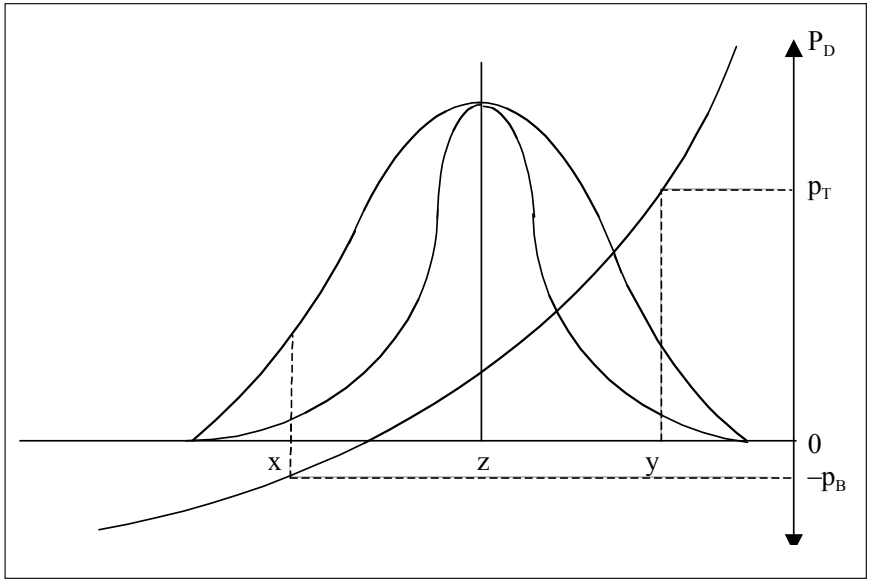
technical *regress* on Danilo's farm, reducing the productivity of land and any other endogenously priced factors (Coxhead 1999).

Stream flow variation, flood and drought

While the long-term degradation of watersheds is a major economic as well as environmental problem, droughts and floods capture the headlines. With some minor modifications, the geometric analysis in this chapter allows one to capture such events, which are low in probability but high in impact.

To focus on the main story—that of downstream damages—one may abstract from Ursula's demand, supposing it to be fixed in each period. This makes her marginal benefit curve vertical in Figure 5 at a point like *z*. Now suppose that as a result of Ursula's activities, the flow of water reaching Danilo becomes more variable. This is shown in the figure by a pair of probability distribution functions ("bell curves") representing the probability that flows of a given magnitude will occur in any period. The narrower bell curve indicates little variation in stream flow, while the wider one indicates stream flow that is more prone to extremes of drought or flood.

Figure 5. Drought and flood probabilities and values associated with degradation of upper-watershed biological function



Suppose further that Danilo's production technology has been chosen on the basis of water availability assumptions corresponding to the mean of the distributions, and that departures from that quantity in either direction are increasingly costly. An example might be that of an irrigation system which is robustly resilient to minor fluctuations around an expected flow, but increasingly vulnerable to large changes in flow, that is, conditions tending toward drought or flood. The diagram uses the differences between the two probability distributions to illustrate the consequences of upper-watershed degradation on variability in stream flow. As the flow decreases in the right hand side of the distributions, Danilo is willing to pay ever-higher prices for water. To the left, the MB curve and willingness to pay both become low, then negative at high flow rates. The diagram suggests that if stream flow varies little, the marginal value to Danilo will fall between p_T and $-p_B$ approximately 95 percent of the time (roughly the interval shown by the distance *xy*).

In the degraded case, the probability of disastrously costly high or low flows increases, as shown by the larger mass of the wider bell curve lying outside of the interval *xy*. Increases in the variability of flows also translate into increased variability of the net incomes of water users (Provencher and Burt 1994). Once again, if very high or low values of stream flow disrupt production and/or require additional costs (including well sinking, flood control measures, and even disaster relief), then there is a mandate for intervention with policies to reduce the probability of their occurrence. These may, and indeed should, include measures to address the problem at its source, i.e., in the agricultural and land management practices of Ursula.

It is also important to note that nonwater agricultural policies and water flow variability interact. In Figure 5, an increase in output price for Ursula would shift the mean allocation *z* to the right, reducing Danilo's expected water supply in every period. It would also increase the probability that in drier seasons, Danilo will receive less than a critical minimum water supply. This situation will further worsen if Ursula's actions in response to the policy will also result in greater stream flow variability.

Distributive and welfare considerations

All the nonmarket remedies for water management discussed so far have one thing in common: they impose penalties of one kind or another on the

upstream farmer. This may be environmentally apt, but one must remember that with the exception of some large-scale commercial plantations, most upland farming in the Philippines is carried out by extremely poor people. Taxes and quotas on Ursula's activities will therefore tend to worsen poverty and increase inequality even as they increase *aggregate* welfare.

To make environmental protection measures politically and morally acceptable, some form of compensation is desirable. This welfare criterion suggests that market-based instruments are preferable to quotas or other regulatory measures, since not only do the latter not reward the poor for their sacrifice; they also fail to generate revenues that might be used to fund a compensation scheme. A growing policy literature explores practical means to compensate the poor in uplands for their stewardship of forests, soils and water (see, for example, Pagiola et al. 2002 and Francisco, Chapter 6, this volume).

Coordination of policies and institutional reforms

All proposals for direct policies to alter upland water users' behavior, regardless of whether they involve taxation on the "polluter pays" principle or compensation on the alternative principle of "reward preservers," entail the need for incentive compatibility.

Direct taxation or compensation mechanisms must be linked directly to the use of the resources in question, or they will have no more effect on behavior than would any lump-sum tax or transfer payment. It follows that linking rewards to behavior requires that tax or compensation schemes acknowledge that upland communities have some form of property or use rights over natural resources.

In the Philippines, the current law asserts State ownership of all water resources, and then concedes water rights for specific purposes by specific users. However, these rules do not apply in practice to the uplands due to the nonpoint source problem and the inadequacy of the resources provided to the regulatory agency, the National Water Resources Board (Rola et al., Chapter 8, this volume). Hence, the institutional foundation upon which to build an effective tax or compensation scheme to regulate water use in uplands does not yet exist.

Proposals for policy innovations or reform must therefore go hand in hand with the reform of institutions and legal restraints governing the ownership of water—just as they have in the recent past for forests.

Philippine policies affecting upland farms

For the past several decades, rapid agricultural growth in Philippine uplands has been fueled by a combination of three factors: a) population growth and migration; b) unrestricted (or minimally controlled) access to forests and forest margin areas for conversion; and c) agricultural development policies that provide incentives for upland farmers to intensify land use by planting vegetables and corn rather than perennials or agroforestry crops. Population migration, driven by low rates of job creation in nonagricultural sectors and lowland agriculture, raised upland population growth rates far above the national rate in the period 1960s-1980s, and this was associated with rapid expansion of cultivated upland land (Cruz and Francisco 1993).

Whereas expansion of agricultural land area was almost certainly an appropriate agricultural development strategy in earlier decades when land was abundant, in the final quarter of the twentieth century, the conversion of forests and upper watershed areas to agriculture (and especially to production of annual crops) became a significant source of environmental problems. A large proportion of the uplands have steep slopes which, once cleared of permanent vegetative cover, are prone to severe land degradation, particularly soil erosion. Shifting cultivation systems traditionally practiced by indigenous communities were environmentally sustainable in the past, but increased population pressure in uplands has reduced fallow periods, and the more intensive farming practices of new immigrants to the uplands are more land degrading (David 1988; Cruz, Francisco and Tapawan-Conway 1988). Recent estimates suggest that between 74 and 81 million tons of soil are lost annually through erosion from upland farm lands, and that between 63 and 77 percent of the country's total land area is affected by erosion (FMB 1998).

The recent development of commercial agriculture in Philippine uplands and side-slopes has been dominated by corn and vegetables, crops that have steadily supplanted earlier farm land uses dominated by perennials such as coffee and abaca. This trend is in part due to improvement of physical and market infrastructure, which makes it feasible not only to produce perishable crops in the uplands but also to reduce reliance on own-production for subsistence.[1] Cereals, principally lowland irrigated

[1] This is seen in a decline in area planted to white corn (mainly for human consumption), and a rise in that of yellow corn (mainly for animal feeds) in key corn-growing provinces (Chupungco 2003a).

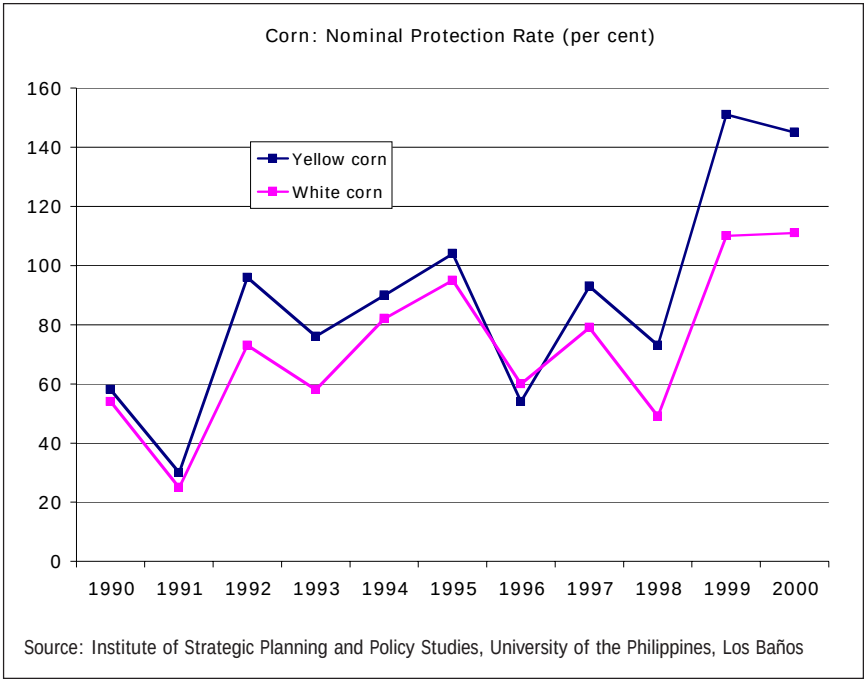
rice, also benefited from publicly funded irrigation investments and research and extension programs. However, it is equally significant that from the early 1960s, coffee, abaca, and other exportable crops grown in uplands were also subject to explicit and implicit export taxation, while corn and vegetable growers, who competed with imports, benefited from steadily increasing subsidies. These subsidies were provided largely, though not exclusively, through import restrictions that pushed up domestic producer and consumer prices. These measures were further reinforced by subsidies on fertilizer and agricultural chemicals (David 2003).

Imports of rice and corn, the principal cereals, have been heavily regulated in pursuit of 'food security'—in practice defined as self-sufficiency with stabilized prices. The State has long retained monopoly over international trade in these products and their substitutes, and its practices meant that domestic prices of rice and corn were determined substantially independent of international prices. Over time, the rate of protection provided to cereal producers has steadily risen, reversing the anti-agriculture biases in development policies of the 1950s–1970s. Corn producers, in particular, gained increasingly from trade policy trends, with the effective protective rate for this crop rising from near zero in the late 1960s to above 70 percent in the early 1990s (Pagulayan 1998; David 2003), and more than 90 percent by the decade's end (Figure 6). Accession to the World Trade Organization (WTO) has thus far had a minimal impact on the protection accorded to corn producers. Since corn is grown very widely in uplands (with upland rice, it accounted for about 45 percent of cultivated land on slopes of above 18 percent in the late 1980s), increased protection had a direct and negative environmental impact through expanded and intensified use of upland land.

A similar story applied to protection of vegetables, the other major seasonal crop grown mainly in uplands. Direct import bans were long applied to some crops (potato, garlic and cabbage), and had the effect of raising their domestic prices far above international prices (Coxhead 1997). These have since been "tarrificated" under the terms of the Philippine accession to the WTO, but in practice, protective rates have remained high—and post-WTO protective rates for some vegetable crops have even risen (Chupungco 2003b). Like corn, vegetables are now among the most highly protected commodities in the entire Philippine economy (David 2003).

These policy trends, and in particular the persistence of high rates of protection for upland crops, translate into additional demands for upland

Figure 6. Nominal protection rates for corn, Philippines, 1990-2000



land by farmers, and in turn into additional pressure on water resources. Not only does upland demand for water increase, especially for water-intensive vegetable crops and for the consumption demands of the upland households that grow them, but supply also diminishes and becomes more variable as perennial crop and forest cover is removed to permit the spread of seasonal crops. This consequently leads to reductions in water retention capacity in upper watershed areas and increases in runoff not merely of water but also of soil, agricultural chemicals, and various forms of waste.

Agricultural growth, stream flow and water quality in Lantapan, Bukidnon

Empirical validation of the links between national policies, institutions, land use, and water resource outcomes is a difficult and imprecise art.

Fortunately, a long-term research project in the southern Philippines provides many of the pieces of the puzzle.[2]

Lantapan municipality in Bukidnon province is representative of the Philippine upland agricultural development experience. The municipality is contained wholly within the Upper Manupali River watershed, which drains the southern slopes of the Mount Kitanglad Range, about 15 kilometers southwest of Malaybalay City. The landscape climbs from river flats (300-600 meters) through a rolling middle section (600-1100 meters) to high-altitude, steeply sloped mountainsides (1100-2900 meters).[3] The municipality contains several subwatersheds draining south or southeast from the Mt. Kitanglad Range to the Manupali River. In the lower part of the area, the river runs into a dam which diverts flow into a network of canals comprising the Manupali River Irrigation System (MANRIS), a 4,000-hectare system constructed by the National Irrigation Administration (NIA) in 1987. The river also feeds the municipal water supply of the city of Valencia. The entire system ultimately drains into the Pulangi River, one of the major waterways of Mindanao Island, about 50 kilometers upstream from the Pulangi IV hydroelectric power generation facility, one of the six largest hydro power generating plants in the country. Local soils and rainfall patterns are typical for Mindanao uplands.

Lantapan's agricultural land area in 1980 totaled 14,400 hectares, more than half of which were classified as being under temporary crops. A small part of this, at the eastern boundary of the municipality, is irrigated for rice production but the majority of farming takes place in rainfed upland and highland zones. The lower part of the rainfed area is devoted to corn and sugarcane production, while corn is the dominant crop in the upper part. Coffee is an important secondary crop at middle altitudes, while at higher elevation, corn is planted alongside both coffee and temperate-climate vegetables such as beans, tomatoes, cabbages and potatoes.

With much of the municipality classified as public land, including the large area now classified as the Mount Kitanglad Range Nature Park, there were few restrictions on the opening of land for cultivation. As a

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[2] This refers to the SANREM CRSP project (see Coxhead and Buenavista 2001).

[3] Subsequently, the middle altitude area will be referred to as "lower watershed" and the high altitude as "upper watershed."

result, the decades from the 1960s to the 1990s saw wholesale conversion of forest to farm land. Remote sensing data reveal that between 1974 and 1994, the area of primary forest fell from 52 percent of total municipal area to 29 percent, while that devoted to corn or corn-based farming systems expanded from 28 percent to 49 percent (Figures 7 to 8).

Land conversion has also meant the spread of annual cropped area into higher-altitude areas and more steeply sloping lands. In one-third of Lantapan's land between 650 and 1000 meters above sea level—the mid-altitude zone encompassing most "upper watershed" agriculture—the share of forest in total land use fell over 67 percent in 1974 to 23 percent in 1994, while the area farmed rose from 25 percent to 63 percent. In lands of 10 to 20 percent slope, covering one-fourth of the municipality, forest area fell from 70 percent to 39 percent, and farm land expanded from 18 percent to 41 percent over the same period. In the 20 to 40 percent slope range, forest fell from 88 percent to 60 percent, and farm land rose from under 5 percent to 14 percent. Similar proportional changes were recorded in even steeper, and thus more vulnerable, areas (Li Bin 1994). This movement of agriculture up the side slopes of the watershed exposed ever-larger and more fragile soils to rainfall and erosion.

Demography has clearly been a major factor associated with agricultural expansion. As in other upland areas of the country, Lantapan's population has risen much faster than the national average in postwar years (Table 1). The municipality's population growth rate was more than 50 percent above the national rate through the 1970s and 1980s; only in the 1990s, with extensive growth in nonfarm jobs, did it begin to converge on the national rate. Estimates of population growth rates in the upper watershed suggest that it peaked at nearly 5 percent in the 1980s. It may have fallen sharply in the past decade.

The rate of population growth is subject to several important influences, including in situ property rights,[4] the prevailing economic environment, and the opportunities presented by physical and market infrastructure. Net migration is one response by individuals and households to

[4] Property rights, in various forms, emerge as important influences in local interviews. According to residents, recent slower population growth in the upper watershed is due to implementation of the NIPAS law; the vigilance of the indigenous peoples who now claim the area as ancestral domain, and increased perceptions of rebel activity. All these factors make it harder for migrants to colonize and retain farm land at the cultivated margin.

Figure 7. Lantapan: land use distribution, 1973

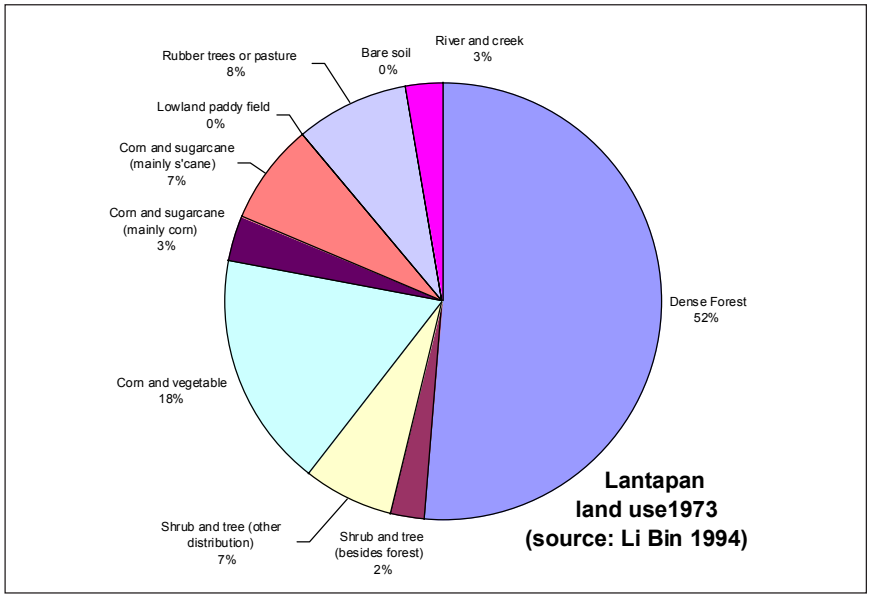

Figure 8. Lantapan: land use distribution, 1994

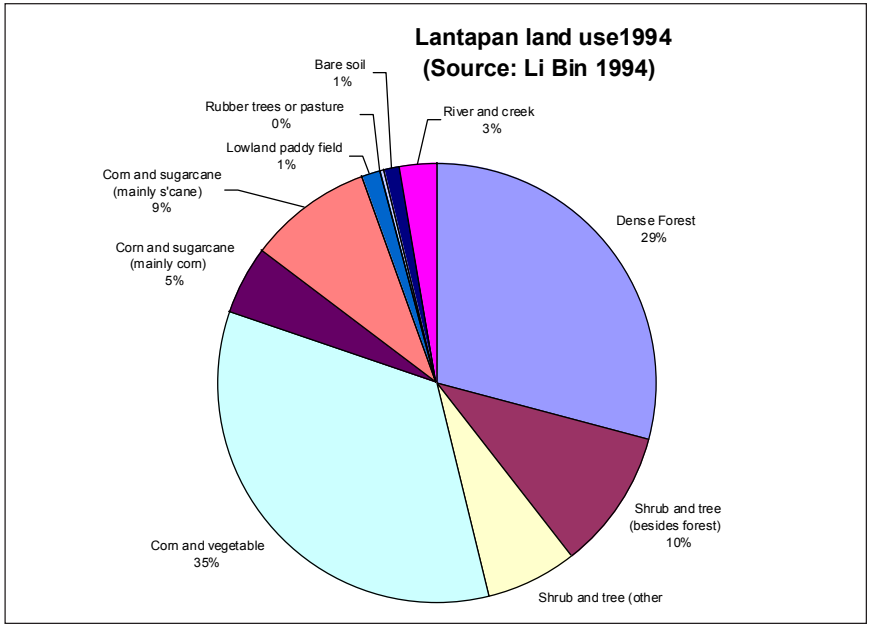

Table 1. Population growth rate by location, Lantapan, Bukidnon and the Philippines, 1970-2000

	1970-80	1980-1990	1990-2000
Lower watershed*	4.95	4.26	2.62
Upper watershed	2.96	4.47	1.94
Lantapan	4.16	4.00	2.36
Philippines	2.75	2.35	2.34

Source of basic data: National Census and Statistics Office, various years.
*This estimate includes the middle section and the river flats of the watershed.

economic opportunities within the watershed compared with those outside.

The other important set of incentives to expand agriculture runs through markets for agricultural products and inputs. In spite of rapid economic growth in recent decades, agriculture continues to dominate the economy of the municipality and of the province.[5] Agricultural expansion and intensification have been prominent features of Lantapan's development. Over time, however, the farming system has undergone a major change, from largely subsistence production, supplemented by a little coffee, abaca, and other easily stored and transported commodities, to large-scale corn and vegetable production.

The cultivation and spread of corn and vegetable crops has received considerable encouragement in the form of restrictive trade policies and price supports (see pp. 166-168). Higher and more stable national prices of these crops have significantly influenced local land use decisions (Coxhead et al. 2001; Coxhead et al. 2002). Plot-level data show that in the past decade, the area planted to crops other than corn and vegetables by upper watershed farmers has halved as a percentage of planted area (Table 2). Corn, meanwhile, expanded from a little over half of planted area in 1994 to over 80 percent in 2000. The percentage of corn in total area dropped (to 59 percent) only in the 2002 survey, following the end of an era of strong growth in corn sector protectionism (Figure 6).

[5] In 1988, 71 percent of provincial employment was in agriculture, 5 percent in industry, and 23 percent in services; agriculture provides the primary income source for 68 percent of Bukidnon households (NSO 1990). Provincial data in the 1990s reveal that agriculture is still a dominant employer.

Table 2. Planted area (hectares per farm) by upper watershed farmers, Lantapan, 1994-2002

Year	Corn	Vegetable	Other crops	Planted area
1994	0.99	0.26	0.61	1.86
(% of planted area)	53	14	33	100
1996	0.61	0.26	0.18	1.05
(%)	58	25	17	100
1998	0.81	0.27	0.13	1.21
(%)	67	22	11	100
2000	1.05	0.05	0.18	1.28
(%)	82	4	14	100
2002	0.69	0.29	0.19	1.17
(%)	59	25	16	100

Source: SANREM survey data

Environmental consequences

Agricultural intensification without adequate soil management has negative effects both onsite and offsite. Intensive cultivation of annual crops in general, and the increased use of fertilizer, pesticides and other chemicals on vegetable crops in particular, degrade water quality and create health problems for farm families and those living downstream. The downstream consequences of these trends have been severe. Water pollution measures in the lower parts of the municipality and further downstream reflect high soil and bacterial loadings. Total water delivery has declined, and stream flow variability has increased, leading to periods of complete drought in some rivers during extended periods of low rainfall. Concomitantly, flash floods are more frequent in the streams passing through more intensively farmed areas.

While there is a lack of data that trace changes in total stream flow, water quality, and the variability of flows directly to land use changes, the circumstantial evidence is very strong. Rola et al. (Chapter 8, this volume) provide documentation of this based on several years of monitoring stream flows and water quality by a locally based citizens volunteer group. In particular, they note a very strong correlation between measures of water pollution and disrupted stream flow with population density and area farmed (Figure 4 in Chapter 8). Measures of total suspended solids (TSS) across subwatersheds were considerably higher in those where

agricultural cultivation was more widespread, in spite of lower average slope. Seasonal TSS peaks appeared to coincide with months of intensive land preparation activity. Perceptions of pesticide residues have made some residents reluctant to bathe animals in streams during or after rainfall events. Significantly, many of the more noticeable changes in water quality and seasonal flows have occurred recently, "well within human memory" (Deutsch et al. 2001).

Other consequences of rapid and increasing soil erosion rates can be seen in the deterioration of the two water impoundment structures, the MANRIS diversion dam and the Pulangi IV hydro power installation on the Pulangi River, located a few kilometers below the junction of the Manupali. The Pulangi reservoir has become about half-filled with silt in less than a decade since its construction, and a National Power Corporation (NPC) staff reports that water supply and quality problems prevent the facility from running at full capacity for more than short periods. During the 1998 El Niño drought, supplies to the dam fell so low as to reduce production to just 2 percent of capacity (NPC, personal communication).

Erosion-related problems have also plagued the MANRIS irrigation network. In 1987, the Asian Development Bank funded the construction of a diversion dam and network of concrete-lined irrigation canals with a nominal service area of 3,350 hectares. However, as early as 1991, NIA data showed the area actually irrigated to be about 1,000 hectares in the wet season and about 790 hectares in the dry season (CRC 1993). Current estimates of irrigated areas in Bukidnon province show a slightly declining trend.

According to staffs of the NIA, the major reason for this very rapid degradation of the irrigation service area is sedimentation in the diversion dam and siltation of canals and other structures. Volume of sedimentation and cost of dredging through time show the extent of environmental and economic consequences of agricultural practices upstream (Table 3). Increased seasonal variance of water supply to the system—a problem exacerbated by more rapid rainy season runoff from denuded upland areas—may also play a role.

Finally, while recent data suggest that net deforestation rates may have slowed in the late 1990s to near zero (Clark 2003), the persistence of agricultural production at the margins continues to pose potential threats

Table 3. Volume of sedimentation and cost of dredging, Manupali River Irrigation System, 1995-2000

Year	Volume of sedimentation (m^3)	Total cost of dredging (PhP)
1995	611.20	9,923.60
1996	13,437.40	333,400.90
1997	12,609.40	435,556.10
1998	7,070.80	119,425.80
1999	10,776.00	454,751.30
2000	19,603.80	710,601.90

Source of Data: Duque et al. 2001

to the integrity of the watershed. Threats include reductions in the water retention capacity of the upper watershed, thereby leading to changes in the quantity and seasonal distribution of water flow in springs and rivers, and possibly irreversible reductions in biodiversity.

Conclusions and implications

This chapter first examined the simple economics of competition for water by users located along a river. The analysis compared a notional Coasian (market) solution to the water allocation problem with the more realistic case of open access. Through the use of a simple model, several implications were shown.

First, it highlighted differences in the valuation of water between users, indicating inefficiency in water allocation and suggesting that welfare could be improved through appropriate interventions. Some of these interventions were then considered and in the process, it was shown that most of the direct water policy measures implicitly concede some degree of property rights, or at least use rights, to upstream users. One important conclusion, then, is that the design of water policy in the Philippines must be accompanied by institutional reforms that would enable the linking of policies to water users' actions.

Second, water valuation and allocation are also influenced by policies directed not at water use but at other targets, most obviously agricultural development. A policy that raises farm prices in one part of a watershed, for example, can result in changes in water demands by farms and thus widen the disparity in water valuations between competing users.

The implication of this finding is that the design of water policy must take account of the broader economic policy environment. Changes in economic policies have the potential to impede or subvert the operation of water resource allocation mechanisms.

Third, the theoretical model highlights the interaction of water policies and distributional concerns. If upstream water users are generally poorer than the population at large, policy design must allow for distributional and poverty effects. This should direct attention toward policies that "reward preservers" rather than "make polluters pay." This involves compensating upstream users for their adoption of good practices rather than punishing them for failure to do so. The practical design of such policies remains an open question.

These theoretical results were then augmented by data that contribute to the building of a causal chain from policies and institutions to water allocation outcomes.

First, Philippine agricultural development policies have strongly favored expansion of agriculture in the uplands, and the production of seasonal rather than perennial crops by upland farmers. Second, institutional failures—the lack of well-enforced property rights in both land and water—have virtually ensured that such economic incentives result in overexpansion of agriculture and rates of watershed degradation that are surely excessive when seen from the point of view of society as a whole. Third, on the basis of long-term data gathering and analysis in a typical upland watershed, farmers' land use decisions are shown to be responsive to the signals that national markets convey, and the resulting land use patterns display a very strong correlation between land use intensity and the degradation of measures of watershed function.

The task of fixing water allocation mechanisms is even more difficult than that of understanding them, since it is subject to the additional constraint imposed by political exigencies. Nevertheless, building an understanding of the interactions of economic incentives, policies, and institutions is an important step toward the building of policy coalitions whose common interests are served by concerted action. It is hoped that this chapter has contributed to that understanding.

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8 Water resources management in a Bukidnon subwatershed: what can community-generated data offer?

Agnes C. Rola, William G. Deutsch, Jim L. Orprecio and Antonio T. Sumbalan

Introduction

A critical element of a watershed-based approach to water resource management is the involvement of local communities. Local stakeholders involvement leads to more locally relevant solutions that take into account unique social, economic, and environmental conditions and values (Bonnell and Baird n.d.; Saravanan, n.d.). In addition, local stakeholders participation creates a sense of ownership of identified problems and solutions, thereby ensuring the drawing up of sustainable water management plans.

This chapter presents the results of a case study in Lantapan, Bukidnon,[1] which facilitated the now evolving partnership between local communities and their governments in the management of water resources. The study investigates the initiatives of an emerging local institution—a group of local volunteers trained to become community water monitors—formed out of a project activity known as the Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM CRSP)[2] in providing community-generated water data for local policy and action. It shows that local people with sufficient training are in a position to monitor the state of their own water resources and thus contribute to local policy and governance. This kind of involvement, how-

[1] This is the same case study site described in Chapter 7.

[2] SANREM CRSP brings together researchers from universities and specialist institutes in the Philippines, the U.S., and other countries as well as the International Agricultural Research Centers to work with farmers and other natural resource managers, communities, civil society institutions, and government agencies at local and national levels in the search for means by which upland communities will be able to make better natural resource management decisions. The project is funded primarily by the United States Agency for International Development.

ever, has to be institutionalized to be sustainable. Institutionalizing this partnership at the local government level would require formal recognition of local groups' role through some form of ordinances.

This chapter is divided into six parts. The second following the introduction discusses the conceptual framework used in the light of development eras and the corresponding institutional shifts in environmental decisionmaking. The succeeding section reports on the evolution and experiences of the community water monitors in Bukidnon, with the water quality and quantity data gathered by these monitors discussed in relation to the policy advocacy activities at the local level. The next part describes the administrative and policy setting in the study site, a representative picture of environmental resource governance in upland communities of the Philippines. The second to the last part offers possible avenues for institutionalizing/integrating the water watch group and their monitoring functions in the administrative setting described in an earlier chapter. The final section presents a brief conclusion.

Institutional innovation and water resources management[3]

The involvement of local communities in the management of their environment and natural resources seems to have evolved in response to the demands brought about by the various stages in the development course of an economy, in particular those in the uplands. The question is how prepared are the local communities to take on this responsibility; do they have the capacity and appropriate institutional backing to support and sustain them in this task?

If one follows the framework developed by Rola and Coxhead (2004), as depicted in Table 1, where they show the various stages of economic development alongside the corresponding institutional shifts in the decisionmaking and management of the environmental resources, one will agree that the shifts in institutions in the management of said resources must take place at the same pace as the various phases in economic development. For if institutions lag behind and are not able to cope with the changes in economic development and their corresponding demands on the environment, then the result will be environmental degradation.

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[3] The authors acknowledge the contribution of Ian Coxhead in this part of the chapter.

Table 1. Environmental management decisionmaking in the various stages of development: a framework of analysis (adapted from Rola and Coxhead 2004)

Development Phase	Dominant Decisionmaker for Environmental Resources
Pre-modern (pre-WWII)	Communities through customary laws
Early development (post WWII – 1990s)	State/central government via command and control measures
Late development (1990s– present)	Local governments and communities but with vestiges of national government control

For instance, during the premodern development phase covering the period before World War II, environmental management and decisionmaking used to rest with the local tribes and communities through customary laws. At the time, population was sparse and production was primarily for subsistence. Thus, the demand for resources was low and the technologies available for the exploitation of resources were limited. Decisionmaking and management of such resources through customary laws were therefore adequate and suitable.

However, after World War II, when commercialization, population growth, and the introduction of new technologies grew exponentially and pushed coastal cities and lowland areas to expand to the upland, the central government became the steward of the environment.

During this era, the standard approach to natural resource management, including that of water resource, was based on regulatory interventions through command and control measures.[4] Thus, central government agencies set policies for forest and land use, and development of irrigation and other water-related infrastructure.

In the Philippines, the responsibility for water and watershed resources under the umbrella of the National Water Resources Board (NWRB) was shared among three ministries/departments, two public cor-

[4] Command-and-control measures refer to decisions or actions such as the enactment of laws by political authorities mandating people or firms to follow a certain behavior or rule, which, when violated, will be correspondingly meted by fines or penalties.

porations, and more than eight bureaus or offices.[5] Despite this involvement of a number of entities—or perhaps precisely because of it and a lack of coordination among said entities—this era of central government control not only in the Philippines but also in other parts in Asia was also the time when the rates of environmental degradation and natural resource depletion accelerated most rapidly (see also Coxhead and Jayasuriya 2003). One reason for this may be institutional failures like the lack of well-enforced property rights in both land and water resources that could have coped with the pressures of higher demands for these resources' use due to higher population and increased economic activities. Though some gains in watershed management were made, where government actions were supplemented by direct (or "project") initiatives aimed at altering resource use by individuals, firms or small groups, and making use of community or foreign aid resources,[6] such actions, like the command-and-control measures, typically had a very mixed record of success.

After years of failed attempts at centralized control over watershed and water management, opinion has now turned decisively in favor of local approaches. In the late development phase, in many parts of the developing world, including the Philippines, this shift coincided with the decentralization of numerous other government functions.

Can local governments do a better job of water management than central governments? Some advantages are clear; local administrations can be expected to have specialized knowledge of environmental and economic conditions, and therefore should also have the ability to finetune policy. Still, there are disadvantages (Coxhead 2001), which include, among others, the lack of capacity in the conduct of analysis, policy, and fiscal powers needed to implement some measures.

In pursuing these responsibilities, local governments should thus seek the collaboration and participation of both public and private sector in a broad range of ecogovernance initiatives. Collaborative management initiatives may incorporate strong poverty alleviation measures that ex-

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[5] These are the Dept. of Public Works and Highways (MWSS, LWUA, BRS); Dept. of Agriculture (BSWM), Dept. of Environment and Natural Resources (FMB), as well as PAGASA and NEA, the National Power Corporation, and the National Irrigation Administration. Source: FAO: AQUASTAT.

[6] A good case study is documented in Kahublagan sang Panimalay Foundation, 2001. Watersheds' Learning Communities. Ford Foundation; or publications from the Philippine Watershed Management Coalition (http://www.watershed.org.ph).

pand access to water and other basic services and help rural communities identify sustainable livelihoods (DAI n.d.). Co-management approaches can be employed to build on partnership and collaboration from stakeholders. Through collaborative management, voices of the most vulnerable in society may also be heard in decisionmaking.

Thus, building strong constituencies for improved environmental management is one of the key entry points in managing natural resources. One caveat, though, that needs to be mentioned is that while in some instances, local communities may be granted some power and authority to manage natural resources, in practice, such power and authority are bounded by existing policies at both the national and the local levels (Contreras 2000). This means that actions by local communities are still subject to review and approval by the government. In some instances, this can lead to serious conflicts.

One way to resolve such conflicts is for groups to agree on the role that everyone needs to perform in the management of resources. In the Lantapan case study, which is cited in the next section, a local water watch group was formed whose main function was to monitor the state of the water resources in the community and to report these findings to the local government. The local government, on the other hand, used the data to design a watershed management plan (Lantapan Watershed Management Plan 2003). The delineation of functions of these two local institutions led to a complementation of work.

The question now, however, is to what extent this relationship can be formally institutionalized. This would depend on the enabling laws, both at the national and local levels.

The Community water monitoring experience in Lantapan, Bukidnon[7]

The Water Watch Group

The Water Watch Group (*Tigbantay Wahig* in the Binukid dialect) started as a volunteer group to support the community-based water quality-monitoring project under the SANREM CRSP for Southeast Asia. The objec-

[7] This section was heavily lifted from Deutsch and Orprecio 2004.

tives of the project were to facilitate the development of water quality and watershed assessments by local communities, and provide physicochemical data that would be used to improve water quality and policy (Deutsch et al. 2001b). Local citizens, including the native tribe (*Talaandig*) members and migrant farmers, volunteered to receive training in water quality monitoring and principles of watershed management.

In 1995, the core group of water monitors proceeded to form a people's organization (The *Tigbantay Wahig*, Inc.) and incorporated themselves as an officially recognized nongovernment organization (NGO). To date, monitoring results of the *Tigbantay Wahig* have been disseminated to community members, educators and local policymakers.

The training program. The first water quality training workshop began in Lantapan on July 4, 1994. Many of the first participants were farmers who had been previously involved in sustainable agriculture projects at the school and SANREM priming activities. Other participants were associated with previous projects of a key partner in the research, the Heifer International, Philippines (HIP). Some trainees were members of the local Talaandig tribal community, the indigenous group that claims ancestral land rights to much of the Manupali watershed.

The workshop lasted three days and included extensive hands-on activities in addition to classroom training. The basic approach was to introduce concepts of watersheds and environmental management, then provide instruction on the use of water-monitoring equipment. The test kits were portable and intended for field use by nonspecialists.

The water chemistry test kit being used had originally been custom-made for the Alabama Water Watch, a water-monitoring group in Alabama, USA. It provided supplies for measuring water temperature, pH, alkalinity, hardness, dissolved oxygen and turbidity and the results from this test kit had been compared with those of Standard Methods analyses and found to be within acceptable limits of bias and precision. Thus, the water chemistry protocols had previously received US EPA (United States Environmental Protection Agency, a US regulatory agency) approval for use by community-based water management groups in Alabama in the United States.

After the introduction of basic concepts, the second part of the first workshop was to conduct training in the measurement of total suspended solids (TSS). This water quality variable was of particular interest to both

researchers and farmers because of its obvious link to soil erosion and sedimentation. Erosion of farm land on steep slopes and siltation of streams, irrigation canals, and a local hydro power reservoir were commonly recognized as environmental problems that had direct impacts on people's lives. A research partner at nearby Central Mindanao University oversaw the processing of filters needed to collect the TSS samples, and submitted the data (pre- and postweights of filters) to HIP for storage in a database and electronic transmission to Auburn University.[8]

By the end of the three-day session, about 15 community members became certified water monitors, with the confidence to begin a monthly monitoring program on several sites of four main rivers in the municipality. The HIP program provided staff for technical support of the new group, which named itself the *Tigbantay Wahig*, or water watchers in the Binukid dialect. Later, HIP expanded its field office in Lantapan and built a training center which facilitated the numerous, additional workshops that have been conducted for water monitoring groups.

Over the next one to three years, training was provided for measurement of additional water variables, including a) stream biomonitoring using aquatic invertebrates, b) measurement of *E. coli* and other coliform bacteria in water, and c) estimates of stream current, discharge, and sediment yield. The consistent collection of data by the *Tigbantay Wahig* (TW) resulted in the first systematic study of water quality and quantity in Lantapan. Project partners regularly met with the TW to discuss the meaning of the data and to refine the monitoring plan.

Data collection and analysis.[9] Four subwatersheds were the sites of the monitoring. These are the Tugasan, Maagnao, Alanib and the Kulasihan watersheds (Figure 1), in Lantapan, Bukidnon. The subwatersheds differ in terms of forest cover, population and agricultural land use, and these measures are correlated with measures of water quality and stream flow. The water chemistry, TSS, bacterial concentrations and stream biomonitoring were collected for analyses of water quality. The stream current and discharge measurements were related to water quantity, and provided indicators of the amount and variability of stream flow.

[8] Institutional affiliation of lead researcher in the water quality monitoring project.
[9] See Appendix A and Appendix Tables 1 and 2 for details of the methodologies.

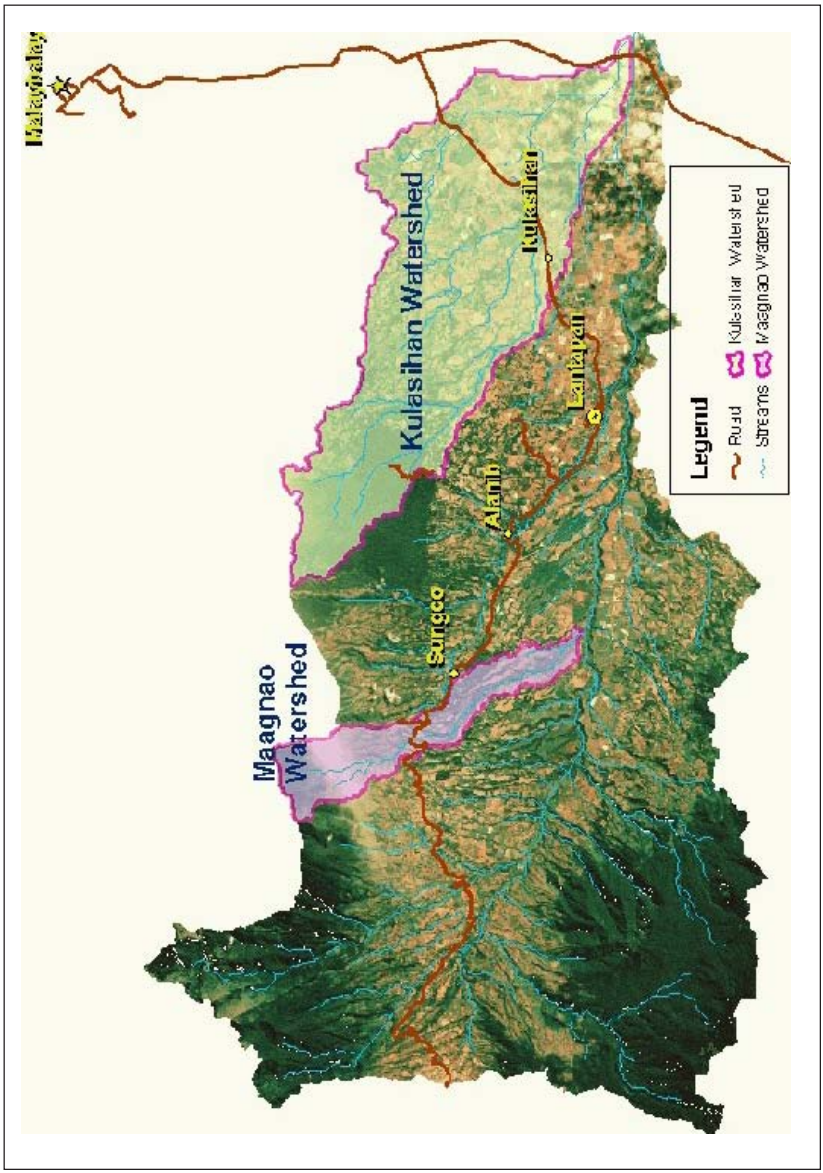


Figure 1. The Lantapan subwatersheds

Over 4,000 water samples have been analyzed by the TW group, and the data sets elucidate watershed trends on a landscape scale. Two of the most descriptive and popular types of analyses for watershed health are TSS and stream discharge measurements. Figure 2 depicts two graphs of TSS from the four subwatersheds of Lantapan. The first was based on about 160 samples collected during the first several months of the project. The second graph was based on nearly 1,350 samples collected from the same streams over an eight-year period.

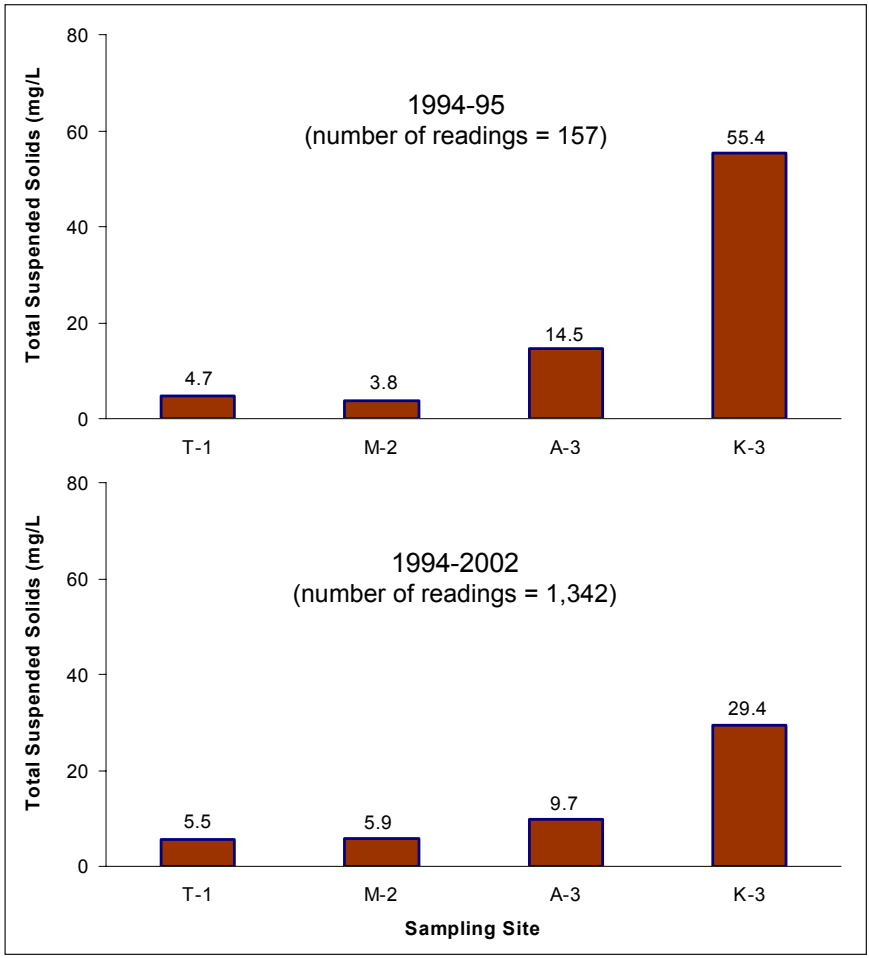
The two graphs in Figure 2 tell the same, basic story. The amount of TSS, as an indication of soil in runoff water to streams, progressively increased moving west to east across the four subwatersheds. The two western subwatersheds had considerably more forest cover and lower human population density than the two eastern subwatersheds.

Results reveal that soil erosion from areas including agricultural land, clear cuts, construction sites, and stream banks was greater in the more developed portions of the Manupali watershed. Perhaps equally important, the TSS results demonstrated that a community group could obtain such valuable information, conducting most field sampling without outside intervention.

The environmental gradient of TSS was generally described by the TW in the first several months of sampling (Deutsch et al. 2001a), suggesting that broad-based environmental assessments may be done by community groups in a cost-effective way over a relatively short period. More subtle changes within the subwatersheds were quantified by continued monitoring over several years. For example, the observation that TSS in the Kulasihan River had a lower average concentration from 1994 to 2002 than in 1994-95 was probably because of the two drought cycles of 1998 and 2001. During the droughts, runoff to the Kulasihan River was significantly reduced and erosion would therefore be reduced. The increased average TSS in the Tugasan and Maagnao Rivers over the longer sampling period may indicate degradation of these subwatersheds from increasing human population and land clearing. This hypothesis is supported by current census data and community opinion.

Dramatic differences in stream discharge patterns were found by the TW in the Maagnao and Kulasihan Rivers, based on five years of monthly monitoring (Figure 3). The Maagnao River had relatively stable flow, even during severe droughts, ranging from about one to three cubic meters

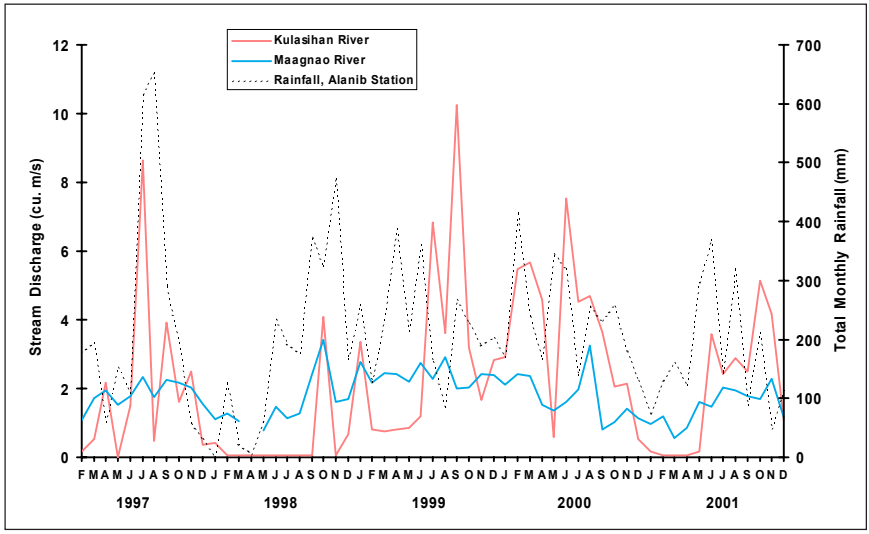
Figure 2. Average concentration of total suspended solids in the Tugasan (T-1), Maagnao (M-2), Alanib (A-3) and Kulasihan (K-3) Rivers in Lantapan, Bukidnon, Philippines



Source: Deutsch and Orprecio 2004

per second. In contrast, the Kulasihan River was very unstable in its discharge, ranging from 0 to 10 cubic meters per second. The discharge of the Kulasihan River was largely influenced by rainfall events, as indicated by the plot of rainfall data collected at a nearby SANREM weather station. The TW data revealed that the Kulasihan River, though rural, responded to rainfall much like an urban, "flashy" stream. This was prob-

Figure 3. Stream discharge of the Kulasihan and Maagnao Rivers in Lantapan, Bukidnon, Philippines with total monthly rainfall, 1997-2001



Source: Deutsch and Orprecio 2004

ably because the subwatershed was mostly cleared of forests and had relatively little infiltration of rainfall to ground water.

Four bacteriological surveys of the same four major tributaries of the Manupali River were conducted in different seasons throughout 1995-96. Bacteriological results were surprisingly similar to the pattern observed for TSS at these same locations, and reinforced the impression from erosion and stream discharge indicators that degradation was occurring in a west-to-east gradient across the landscape. According to the US EPA standards (US EPA 1986), bacterial concentrations in the Tugasan and Maagnao Rivers were generally safe for human "whole body contact," whereas those in the Alanib and Kulasihan Rivers typically exceeded that safety standard by 10- to 50-fold. Since these two sites are densely populated, much of the wastes produced by humans find their way into the waterways.

Bacteriological surveys were also made of community drinking water faucets located in each of the 14 barangays of the municipality. Virtually all drinking water is gravity-fed through a plastic piping system from one of several mountain springs, and is untreated with filters or chemical

sterilizers. Surveys revealed several faucets which had become contaminated with *E. coli* because of breaks in the pipes and seepage into them from contaminated soils and water.

Relating deforestation, agricultural development, and water quality

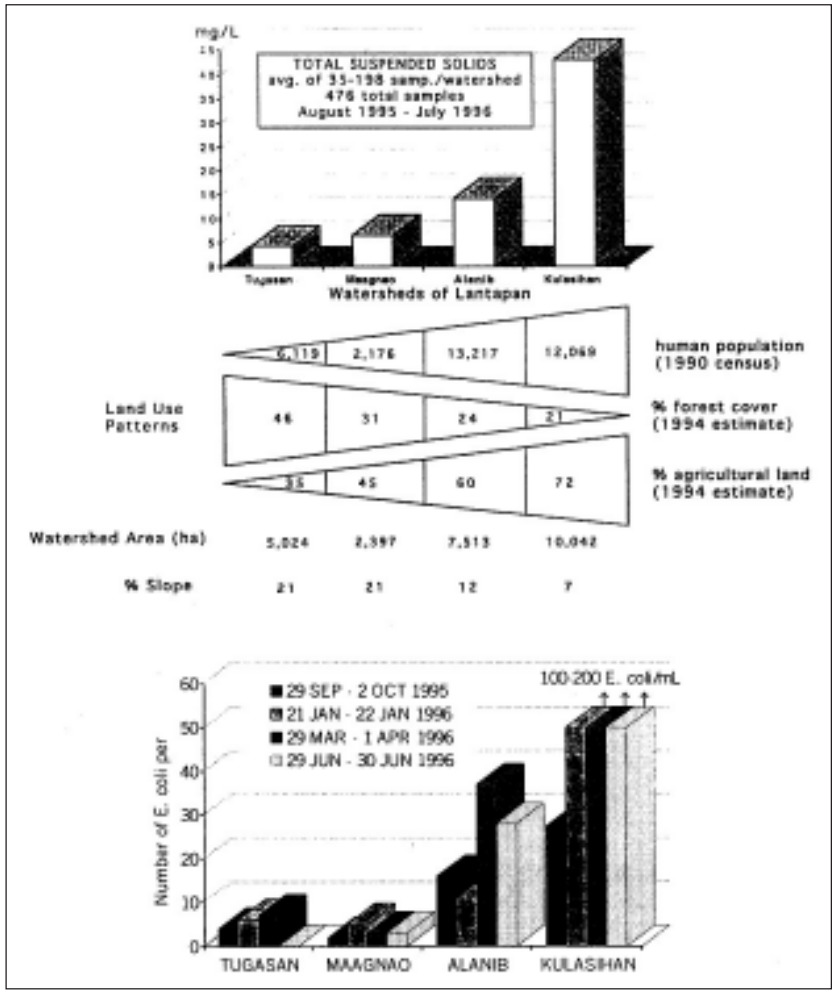
Water quality and quantity sampling in four subwatersheds of the upper Manupali River since 1994 provides one of the very few time series of data capable of linking water trends to deforestation and agricultural development. The progressive decrease in forest cover and the corresponding increase in cleared land from west to east across the subwatersheds of the Manupali River are closely correlated with the patterns of water quality degradation based on the monitoring activity. For instance, TSS is abruptly higher in subwatersheds where forest cover falls below 30 percent and agricultural land makes up more than 50 percent of area. In the case of Lantapan, the western two subwatersheds may be even more vulnerable to severe erosion with deforestation than the eastern two subwatersheds because their average slope (about 20 percent) is much greater (Figure 4). It is also noteworthy that about 75 percent of the population of Lantapan live in the two eastern subwatersheds (although human density in all subwatersheds is similar, ranging from 0.9-1.2 persons per hectare). Much larger populations in the Alanib and Kulasihan subwatersheds, including many more houses and roads, certainly contributed to the sharply elevated levels of soil erosion, *E. coli* concentrations and other measures of water-related problems.

Community's awareness and policy advocacy

As the technical skills of the TW grew, so did their organization and leadership. HIP provided companion workshops for developing the group, helping them plan. Because the water monitoring activity was perceived as relevant to community service and family health as well as being enjoyable, the TW grew in numbers and influence. As previously mentioned, the group incorporated as a registered people's organization in 1995, and they have established by-laws with annual election of officers.

The expanding water data set enabled the TW and other community members to think about the conditions and trends in Lantapan and to begin to understand complex watershed processes. The water monitors

Figure 4. Total suspended solids, land use patterns and concentration of *E. coli* bacteria in four subwatersheds of the Manupali River, August 1995 - July 1996



Source: Deutsch et al. 2001a

now had locally generated information to document several factors which affected water quality and quantity:

a. *Season*. Several variables were influenced by seasonal temperature changes and TSS concentrations were considerably higher in the rainy season than in the dry season.

b. *Multiyear*. Data from a given site over several years facilitated trend analyses to answer the basic question, "Is the stream getting better or worse?"
c. *Upstream/downstream*. Monitoring a longitudinal gradient identified "hot spots," or critical areas of a stream where water quality degraded because of local pollution or changes in water flow.
d. *Interwatershed*. There were distinct differences among the four, contiguous watersheds studied, which related, in part, to geological differences and also indicated an east-west environmental gradient related to land use.
e. *Climactic events*. Several years of stream discharge measurements documented two El Niño events, which had dramatically different effects on different subwatersheds relative to land cover.
f. *Human land use*. How the land in various subwatersheds was used had a clear effect on water quality and quantity. Good water quality was generally correlated with low human population, high percentage of forest cover, and relatively little agriculture.

The reputation of the TW enabled them to initiate various action strategies to disseminate their watershed information and affect positive change. These strategies include environmental education, stream protection and restoration, advocacy and policy and information dissemination and spread.

In terms of advocacy and policy, the TW has consistently provided community feedback of its data and expressed its positions regarding better water policy. Numerous municipal and barangay meetings have been attended by the TW to promote their views of clean water. Representatives of the group addressed the Philippine Congress and the TW has become a model of community participation for addressing watershed issues.

TW's water quality results have been recognized by local government officials in the study municipality. The results of the analysis using the TW data prodded the municipality to design a watershed management plan to arrest the rapid rate of degradation of the water resources in the community. However, the matter of institutionalizing this NGO function is seemingly constrained by the administrative and policy setting for environmental governance in typical upland areas.

How about in Lantapan? What is its administrative and policy setting? Are there opportunities for this group's institutionalization for the management of the area's natural resources, in particular, its watershed resources?

The next section gives a brief description of said setting before and after the process of devolution that was mandated in the Local Government Code of 1991.

Water management in a decentralized subwatershed setting: administration and policy in Lantapan, Bukidnon

The municipality of Lantapan is the headwater of four big river systems which supply water to the Manupali-Muleta watershed. The four main rivers are the Alanib, Maagnao, Kulasihan and the Tugasan Rivers. These supply the water to the much bigger "Rio Grande de Mindanao." However, of late, deforestation and soil erosion are perceived to contribute to the dwindling water supply, which is the primary source of water supply for power, irrigation and domestic use. The restoration of the decreased water supply is therefore of great concern both to the local government of Lantapan and the communities within it.

Administration and policy before the devolution (before 1992)

Vestiges of community-based water resource management can be observed in the traditions being kept by the indigenous peoples in the study area. The "sala," which is a cleansing ritual, has been (and is still being) pursued in the predominantly indigenous communities for members of the tribe who may have violated customary rules and laws. While these customary laws encourage more sustainable practices, the forces of the central government authorizing the logging of the forests in the areas in the post-World War II were too strong for these local communities to resist. Thus, in the lower part of the watershed, much of the forests in the study area were cut during this early development phase. In-migration rate was high and the migrants practiced intensified agriculture (Rola and Coxhead 2004). Water was a free resource during these times. People obtained their water needs from rivers, streams and waterfalls, which are numerous in the area. There were no conflicts seen as people can have all the clean, pure water that they needed.

The forces of the markets that came when agriculture was intensified in about the early 1980s have resulted, however, to water conflicts between lowland irrigated rice farmers and the upland vegetable growers. Households have likewise increased in numbers, as a result of the influx of the migrants in the early 1970s to the 1980s. This has resulted in a more intensive competing use of water.

The Philippines has an enabling law to settle water conflicts. These water laws are contained in the Water Code of the Philippines as stipulated in Presidential Decree No. 1067 of December 31, 1976.

Among the underlying principles of the Code are the following:

1. All waters belong to the state and cannot be the subject of acquisitive prescription;
2. The state may allow the use or development of waters by administrative concessions;
3. The National Water Resources Council (now Board) shall regulate the utilization, exploitation, development, conservation and protection of water resources; and
4. Preference in the use of water shall consider current usages and be responsive to the changing needs of the country.

There are minimal fees charged to obtain a "water right," which gives one the permit to acquire water. However, these fees and water laws in general are not observed in the upland areas, since the regulatory agency is a national level agency. It does not have any presence in the uplands. Thus, in times when increasing competition for water use is experienced, the absence of such institutional structure is much more felt.

Water management is also very much linked with the broader watershed management. Watershed management activities in the early times, though, concentrated in managing the forests only.

In the predevolution period, the claim of Lantapan to watershed management was as a host to the Muleta-Manupali Watershed Development Project (MMWDP), managed by the Department of Environment and National Resources (DENR). This was a reforestation project aimed at overcoming erosion and silting of the Muleta and Manupali Rivers. This project operated in five municipalities of Bukidnon, including Lantapan. The aim of the project was to reforest about 12,000 hectares, provide agroforest consisting of 2,420 hectares, construct 50 units of silt

detention dams, and protect the remaining forests (MMWDP Turn-over documents 1993).

As noted, there were no other activities apart from the management of the forests. For instance, there were none aimed to safeguard water quality. It was not also known to what extent the project management had coordinated with the local governments and communities in the conduct of their activities. The current sorry state of the water resources in the area despite this project could vouch for the ineffectiveness of the top-down mode in water and watershed management.

Administration and policy after the devolution (1992 to the present)

The Philippines' Local Government Code (LGC) of 1991 provides powers for the local governments to be enforcers and implementors of national environmental laws. A DENR administrative order issued in 1992 spelled out the devolved environmental functions. It was, however, only in July 1998 that a manual of procedure was adopted by both the DENR and the Department of Interior and Local Government (DILG)[10] to operationalize these functions.

How has Lantapan coped with these newly bestowed powers? How can these new powers affect the water management by customary rule in the study site, where water in the land of the indigenous tribes is culturally considered as belonging to them? How can water conflicts arising from economic growth be resolved?

During the period 1992-1995, devolution of watershed management saw action at the provincial level only. In 1995, the multisectoral Bukidnon Watershed Protection and Development Council (BWPDC) was established by virtue of a memorandum from then President Fidel Ramos to generate policies and programs concerning watershed management in Bukidnon. Some of the Integrated Social Forestry projects of the DENR were also devolved to the provincial management as early as 1993. A DENR staff from the provincial government was assigned to the Lantapan area to oversee environmental management functions, albeit without a program and a local budget.

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[10] As observed, to this day, most local officials are not familiar with this manual (Oposa 2000).

In 1996, the Lantapan government invoked its mandate from the LGC that enjoined local governments to prepare their own local environmental programs by developing a Natural Resources Management and Development Plan (NRMDP). The key elements in the vision of the Lantapan NRMDP included: a) the improvement of water quality, quantity and distribution; b) conservation of soil for sustained productivity; and c) protection of the remaining forests. To realize these, the NRMDP called for support to programs for natural resources management and improvement of the capability of the local government unit and the community groups for program implementation (Queblatin et al. 2001).

In 1998, a Lantapan municipal ordinance was passed, which set up the structures to provide the implementation of the plan including the creation of the Natural Resources Management Council (Sumbalan and Buenavista 2001). These efforts, unfortunately, did not bring favorable election outcomes for the incumbents who supported the point that "local officials have hardly any incentive to act in the interest of watershed preservation" (CCLE 2000).

In the subsequent period and with technical assistance from the SANREM project team, the new set of municipal officials in Lantapan proposed two ordinances in support of natural resources management that were approved in 2000. These were to encourage the adoption of soil conservation measures and to ban aerial pesticide spray in the banana plantations.[11] Because there is no formal Municipal Environment and Natural Resources Office (MENRO), monitoring of compliance of these ordinances have, however, been limited.

A third ordinance proposed by the new set of officials recommended the payment of water charges by the agribusiness firms. Raw water by Philippine law is free for all. For use of water when diverted/extracted from the natural source, however, water charges have been set by and are paid to the NWRB, the regulatory arm for water resources in the Philippines (NWRB 1976) as earlier cited. The Water Code, the enabling law for water control, access and use, does not provide power for local governments, in general, to collect water charges. Thus, this ordinance finds difficulty passing through the local legislative board. This is one con-

[11] In 1999, two banana plantations were established in the study municipality.

straint of the Local Government Code. Some of its provisions cannot be fully implemented because there are certain national laws that local governments have to observe and make sure that local laws are consistent.

In other places, water users are willing to pay for water use provided the collected funds are retained in the area (Asad et al. 1999). Thus, charging water fees may be legitimate and necessary to fund activities to support management of watershed resources, i.e., surface water (Rola and Tabien 2001).

With the initiative of the local government unit in the early 2000, the rural water supply project funded by the World Bank was implemented. This project was to bring potable piped water to households for a fee. The fee was determined by asking the household's willingness to pay for this service. However, water supply to be tapped for this household delivery is currently not enough (personal communication, Lantapan Mayor Narciso Rubio). One of the perceived reasons for this inadequacy of supply is the seeming unwillingness of the communities in the upper watershed portion to share the water that is in their property to be used for this purpose. For them, this project caters only to the needs of the lower portion of the watershed population at their expense. Thus, there seems to be a clash between the still active customary laws and the State's functions of providing potable water for all. The conflicts in the use of water have now begun.

To partially address the issue, the mayor established the Lantapan Watershed Management Council (LWMC) in August 2001. This initiative was largely in response to the "water watchers"[12] advocacy to save the rivers from being degraded via data presentation to the mayor. The LWMC is a multisectoral group composed of representatives from the Lantapan agribusiness sector, NGOs, people's organizations, members of the municipal legislative council, and the provincial agencies. Responding to the pressure to address what could turn out to be a major environmental crisis, the mayor began negotiating with the local conservation and environmental protection program in the municipality.

[12] This water watch group was discussed in an earlier section of this chapter. The water indicators (discussed in detail in Appendix A) gathered by the water watchers were critical in the mayor's decision.

Because of this development, there was a chance to revisit the NRMDP. Members of the LWMC expressed commitment to undertake some of the environmental management activities stipulated in the plan. The Office of the Protected Area Superintendent of the Mt. Kitanglad Range Nature Park provided planting materials for the restoration of the riparian zones. The Mt. Kitanglad Agri-Ventures, Inc. (or MKAVI, a banana plantation company) management committee passed a resolution to prepare a detailed plan to rehabilitate the Maagnao and Alanib Rivers as the company's contribution to the government's watershed program (Sumbalan and Buenavista 2001). MKAVI management is supportive of environmental objectives, as efforts for sustained water supply directly benefit the plantation. It is too early to determine how the council will fare in watershed management. At the LGU level, there is no office to monitor continuity of activities and projects.

Where will Lantapan go from here? A revisit with the concerned officials in early 2002 revealed that politics and program financing are the major constraining factors in the implementation of the watershed management plan,[13] now popularly known as the Municipal Watershed Management Plan: "Upper Pulangui River Watershed Cluster." Although the mayor is very supportive of the program, some political issues not directly related to the program are getting in its way.

Financial constraints also contribute to the slow implementation of the program. The incumbent mayor has always made his suggestion known, i.e., that municipalities protecting headwaters should have a share in the revenues that lowland communities derive from watersheds. This, according to him, is also one of the reasons why there is a need for the immediate revision of national policies regarding watershed management plan and wealth sharing, as provided in the LGC.[14]

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[13] This evolved from the Natural Resources Management and Development Plan prepared in 1996. A final version of the plan dated August 2002 was written under the auspices of the Canadian International Development Agency. The plan was approved by the Sangguniang Bayan of Lantapan in September 2003 and is scheduled for implementation in 2004.

[14] One good example is the provision in the LCG entitling local government units to a share in the proceeds from the use of national wealth (Chapter 2, Sec. 289-294). In practice, however, the water district directly remits its revenues to the National Treasury rather than to the local governments (as provided in Sec. 293). The revenues are then allocated back to the local government units in the form of Internal Revenue Allotment (Elazegui et al. 2001).

Currently, local officials of Lantapan recognize the issue of the competing uses of water; and the increasing scarcity of this precious commodity. They are aware that with the establishment of agrobased industries brought about by their abundant water sources, domestic water demand is projected to increase. Strategies for equitable and efficient allocation of this commodity among competing groups will have to be defined. At the local level, without the proper institutions in place, certain segments of the population will always suffer from negative externalities, such as water pollution.

Given such setting, how can the community water monitors and their functions as discussed earlier fit in and be institutionalized as part of the natural resource management (in particular, water resource) apparatus?

Toward a sustainable water resource management strategy: LGU and community perspectives

Clearly, Lantapan, like many other upland municipalities across the country, faces a major policy challenge: to promote development that is ecologically, economically and socially sound. Decentralization does not offer an easy solution. While decentralization has been considered a major breakthrough in Philippine legislature, the lack of clear guidelines has caused some local/national as well as interagency tension because of unclear, limited, and oftentimes overlapping mandates (Elazegui et al. 2001). Despite the existing laws and rules, most local officials do not play a significant role in watershed management (Oposa 2000) that could be a result of inadequate capacity to do so.

Responsibilities and funding for protecting the environment are being transferred from the national to regional and local levels in many countries. Accompanying this process is the increased receptivity to the concept of community-based environmental assessment and management.

Whether by formal educational programs, popular media, or personal experience of environmental problems, most people realize the importance of protecting forests, water and other resources. Water issues have been primary in recent international and regional conferences and in meetings of world leaders. Governments are realizing that regulations alone are inadequate to solve the problems, and local efforts that address water issues are increasingly recognized as a vital part of the solution.

For this case, local officials in Lantapan and at the provincial level of Bukidnon have very high environmental awareness. How to institutionalize the community action by local groups such as the activities of the water watch group, however, will have to be threshed out at the policy level. Below are some of the steps that can be taken to promote a co-management of the water resources in municipalities like Lantapan.

Community perspective[15]

A sustainable, local group must have the technical skills to maintain a reputation for collecting quality data. This not only includes the ability of existing monitors to follow protocols and maintain testing equipment but also an adequate number of certified, local trainers to conduct future workshops. The water watch group should be officially linked to local government and business/industry sectors. Endorsement of group activities and recognition of the value of the data by governmental agencies greatly facilitates the establishment of the activity and the use of the information. This partnership will affect the type, amount, and location of water data collected. The information will then be of maximum benefit to local policymakers and future monitoring can adjust to goals and standards of environmental protection.

In this regard, for instance, the municipal government of Lantapan has demonstrated its willingness to use the TW data and allow TW members to participate in Natural Resource and Watershed Councils. Likewise, other local government units like the municipal government of Maitum, Sarangani, have provided training opportunities for members of their staff and have financially supported the monitoring activities of their water watch groups (called the Munong El in Maitum, Sarangani). The governor of Bohol has also invited and supported water monitoring projects within several municipalities of the province, linked to the LETS HELP BOHOL program.[16]

[15] Details are in Deutsch and Orprecio 2004.

[16] The **L**ivelihood **E**nhancement **T**owards **S**ustainable **H**uman and **E**nvironmental **P**aradigm for **B**ohol (LETS HELP BOHOL) program is an integrated area development initiative/program forged between the Provincial Government of Bohol and the Heifer Project-International in 1999. Its objective is to catalyze economic and social growth in the rural areas of Bohol, with livestock as one component infused in the community. The program specifically aims to increase household incomes and reduce mass poverty and malnutrition. It likewise aims to establish mechanisms for achieving sustainable and environmentally sound farming practices.

Links to business and industry are valuable because production practices potentially have negative environmental impacts. In the case of Lantapan, the local banana plantation, MKAVI, has interacted with the TW regarding water withdrawals from the Maagnao River and pollution from plantation effluents. The company has since requested stream discharge data from the TW as an input to its plantation management plan, and has agreed to finance testing equipment for the group.

The examples above begin to describe a sustainable group that remains technically sound, organized and relevant. Such a group develops partnerships and gradually becomes a local institution with a growing sense of mission and political voice.

LGU perspective

The Local Government Code can be revised to strengthen the local governments mandate for environmental management. In this sense, devolution should be accompanied by strict delineation of local environmental programs that local governments can pursue, a budget corresponding to these programs, and capacity build-up in the local government councils.

The following proposed set of strategies may facilitate the government's performance of its role in water resources management, especially in areas like Bukidnon. Partnership with local groups as personified by the *Tigbantay Wahig* can also be defined.

1. Sincere abrogation of power on environmental management functions to local governments.

   Local governments have tremendous powers in the management of their environment, including watershed resources, as provided for in the LGC. But real devolution can take place if the DENR effectively abrogates its powers to the LGUs. In fact, the manual of procedures for the DENR-DILG-LGU partnership designed to effectively implement this already defines a step-by-step procedure. But LGUs have to familiarize themselves with the provisions in the manual and have the political will to allocate funds for subsequent activities, including monitoring of water quality.
2. Provide for a de facto municipal environment and natural resources office (MENRO) in upland communities.

In the present case in Lantapan, a part-time seconded provincial DENR staff mans the MENRO. The seeming conflict of interest stems from the fact that, in this instance, the ENRO serves two superiors, the province and the municipality. Had the Environment and Natural Resources Office been a permanent one under the municipality, it could, for one, keep records of environmental data including the water quality and quantity generated by the "*Tigbantay Wahig*."

The DENR-DILG-LGU partnership manual stipulates that to effectively implement devolved activities, and to fully empower the LGUs to perform watershed (i.e., forest) management activities, they may appoint or designate an ENRO. The creation of the ENR office in the LGUs should be encouraged. But in some poor municipalities, the Municipal Agricultural Officer (MAO) may serve as the de facto MENRO. Thus, this avoids the problem of accountability as in the present set-up.

3. Strengthen the functions of the Environment and Natural Resources Board.

   In the House[17] version of the bill introducing amendments to the LGC, a new title is inserted between Title 5 and Title 6. The title reads, "Local Environmental and Sustainable Development Board." In addition to the functions of the Local Environment and Sustainable Development Board, as stipulated in the proposed House Amendments, it is further proposed that the Board set up local regulatory policies in support of those of national government regulatory agency, the NWRB. The policy statements will contain penalty clauses that are acceptable to the local constituents. Monitoring of compliance of policies will be reported to the Board by the ENRO, in coordination with barangay (village) officials. "Water watch" monitoring function can now be institutionalized in this set-up.

4. Fiscal sustainability of environmental protection projects

   The House bill's (HB 7845) proposed amendment defines NATIONAL WEALTH as: "all natural resources situated within

[17] This refers to House Bill (HB) 7845, principally authored by Congresssman Romeo Candazo during the Eleventh Congress. The corresponding Senate Bill 2046 was principally authored by Sen. Aquilino Pimentel.

the Philippine territorial jurisdiction including but not limited to lands of public domain, waters, minerals, potential energy sources, gas and oil deposits, forest products, flora and fauna, fishery and aquatic resources, all quarry products, and other resources which can be extracted and utilized" (Book II, Title Three, Chapter 2.) It also stipulated that share of the local governments from any government agency or -owned and -controlled corporation be increased from 40 percent to 50 percent. For most of the national wealth projects, the local governments referred to are those that host the facilities or services of said agencies.

For watershed functions like hydropower, agriculture, and household water supply, the host communities of these watersheds should likewise be given a revenue share that may come from the provincial share. Proceeds from this share will be used to maintain, manage and protect the upstream water resources, riverbanks, and coastal resources such as natural sea defenses (i.e., mangrove and corals). Host watershed communities especially in the uplands could be given a fixed proportion of the user charges or resource rents for watershed protection projects (related discussion on this may be found in Chapter 6, this volume).

In the agriculture sector, while irrigation services in the lowlands are managed by the National Irrigation Administration, surface water use for agriculture in the uplands can be managed by LGUs who can in effect charge an environmental user fee. This is feasible according to the LGC. The pertinent local government should be given power to assign fees for this. For polluting industries within the local government's bounds, LGUs should have the power to police and penalize noncompliance of industries to the environmental standards. Pollution standards should be set and should be consistent with national and international levels. Proceeds from the user fees and charges could be the source of operating funds of the local environment and natural resources board; and salaries of the ENRO. This could also be a source of funds for community groups (i.e., *Tigbantay Wahig*) that collect data and participate in defining actions and solutions to natural resources problems.

The example of the *Tigbantay Wahig* collected data triggered local policy action. This community-based water-monitoring model may be expanded to include other parts of the country and accorded the necessary financial and legal support due it.

Conclusion

In response to accelerated economic activities in the rural areas, institutions have to be strengthened or established to minimize environmental damages. Such economic growth, without the proper institutional safeguards, could negatively affect the fragile environments (Rola and Coxhead 2004), especially of the upland communities and their natural resources, especially water. A combination of bottom-up and top-down approaches to water resource management and policy could be ideal. The evidence of water degradation in Lantapan, Bukidnon, while disturbing, unfurls challenges for a more responsible water resource management strategy at the local level, especially in these upland communities.

The SANREM-SEA project demonstrated the feasibility of community-based monitoring of water quality and quantity that was useful in generating data for local policy action. Data were the key in informing and influencing local policymakers to take action. At the same time, it is clear from the *Tigbantay Wahig* example that local people with sufficient training can monitor the state of their own natural resources. The institutionalization of the link between a water group and a de facto environmental and natural resources office of the local government is thus recommended. To sustain these efforts, formal financing and legal support is needed.

Proposals for water sector policy reforms in the country are contained in a number of House bills (i.e., the Water Resources Authority of the Philippines 1997) and numerous policy papers (i.e., the Master Plan for Water Resource Management 1998). They are likewise the subject of several water fora (i.e., the PIDS Water Policy Forum 2002). Proposals to strengthen the environmental management provisions of the Local Government Code have also been formulated. The urgency to implement these various proposals, however, becomes greater, as signaled by the data collected by the grassroots as presented in this chapter. Above all,

the experience of the *Tigbantay Wahig* group illustrates the feasibility of local groups to take active part in water resources management and policy.

Appendix A
Community-based water quality monitoring: rationale and methods

(from Deutsch, W.D. et al. 2001a, 2001b)

Community-based water quality indicators

Several interdisciplinary research projects on soil, water and biodiversity were designed within the larger SANREM/Philippines program. Among them was a project on local water quality assessment and management, whose goal was to foster the development of community-based water monitoring groups, and to collect credible water quality and quantity data that lead to environmental and policy improvements.

The approach of this project was to develop and test specific water quality indicators that were appropriate for natural resource management by community volunteers and the local government unit.

In this regard, the following criteria were established for each indicator:

1. Scientifically valid methods, for credible qualitative and quantitative information;
2. Relevant to the community, for their endorsement and participation in data collection; and
3. Practical and relatively inexpensive, for sustainable use and applications using locally available materials.

Many of the methods used were modeled after those developed in Alabama Water Watch, a citizen volunteer, water quality monitoring program in the US. Filipino partners on the activity helped customize techniques to the local situation. Community volunteer water monitors selected 16 sampling sites on four main tributaries of the Manupali River, including subwatersheds of varying degrees of forest cover, agricultural land, and population.

After several months of testing water for a set of eight to 10 parameters presented in the training workshops, the data began to show that the relatively few parameters related to soil erosion, disrupted stream flows, and bacterial contamination were the most useful indicators. Both the citizen monitors and researchers concurred, and there followed more in-depth study and application of these indicators.

The following is a summary of the rationale and methodology behind each of the key indicators, starting with the qualitative indicator of community perception, memory and experience before the science-based project began.

Indicator #1: Community perceptions, memories and experience

The first dialogues between community members and researchers regarding potential environmental indicators revealed that residents were concerned with water contaminants, such as pesticides and pathogens, in addition to soil erosion and sedimentation of streams and irrigation canals. Some farmers did not water their livestock in streams during rainfall events, citing loss or illness of animals from pesticide runoff. Public health records, although scanty, indicated a higher than average infant mortality and morbidity rate in the community, and many common ailments were caused by waterborne pathogens.

Besides water quality concerns, residents lamented the fact that some streams were no longer maintaining regular flows, but were cycling through seasonal flood and drought. Memories of stable stream flow and clean water were within the last few decades. Flash floods were increasingly common in the eastern part of the Manupali watershed, resulting in severe soil erosion, crop loss and occasional loss of livestock or human life. Overall, the pattern of watershed degradation experienced by the community was typical of that in upland landscapes of the Philippines and in many other parts of the world.

Indicator #2: Eroded soils in streams

Because the community of Lantapan was primarily agrarian, measurements of soil loss and sedimentation were particularly relevant to volunteer monitors. Farmers generally understood that soil loss usually meant a reduction in the fertility of their fields, with accompanying reduction of crop production. Most of the TSS monitoring by the community was done once or twice monthly at four main sites (bridge crossings of the four major tributaries of the Manupali River) in daytime and under base flow conditions. By using the TSS indicator in this way, monitors seemed to determine important trends and patterns occurring in the river valley. Nevertheless, their overall measurements were an underestimate of the greatly increased erosion rates during strong storms. Recognizing this

fact, the monitors began to measure TSS more frequently, just before and during selected rainfall events in each subwatershed. Results were sometimes dramatic, and the TSS indicator became an increasingly important way for the Lantapan residents to quantify environmental change and lay the foundation for local action and policy changes.

Indicator #3: Altered stream flows and soil export

TSS is only a relative indicator of erosion and watershed degradation (a concentration value) and does not provide important estimates of soil loss in water past a given point. Because the streams of the four subwatersheds in Lantapan were similar in size, TSS trends were generally comparable; however, stream discharge measurements were required to use TSS to its full potential and calculate soil export. Moreover, the patterns of stream discharge provided important clues to watershed stability and the effects of land use change.

Typically, stream discharge measurements are made by researchers using expensive and fixed structures and instruments. Such methods are usually impractical for rural communities using their own resources, so low-tech methods were developed and adopted for use by the volunteer water monitors in Lantapan. Stream velocity and discharge measurements were made with locally available materials, including rope, measuring sticks, and a float. A cross-sectional map of each of the four streams was made at the main bridges, using the regular, concrete sides of the revetment wall under the bridge as boundaries when possible. A rope was stretched perpendicularly across the stream between two fixed points and stream depth was determined at one-meter intervals along the rope. Measurements of stream width and depth were used to draft cross-sectional maps and calculate area.

Another rope of known length was stretched parallel with the stream bank to mark the distance that a floating orange (or another tropical fruit) would travel while being timed. Multiple measurements of the time required to float a known distance in different parts of the stream were used to determine average current velocity. Together, the cross-sectional area of the stream (square meters) and its current velocity (meters per second) were used to estimate stream discharge (cubic meters per second).

Indicator #4: Bacterial contamination of water

Levels of potentially harmful bacteria in streams, wells, and piped drinking water were of primary concern to many citizens of Lantapan because of obvious public health risks and personal experiences of illness. As with related memories of community members regarding stream degradation from pesticides and silt, older adults recounted how they freely drank from streams in the past at places that they knew would no longer be safe to drink from today.

Evaluation of water for bacteria in the community had been infrequent, and the tests that were occasionally done by the Department of Health or the barangay health workers only detected the presence or absence of fecal coliforms without determining a concentration value. As with all other techniques and indicators to be developed for practical use, bacteriological monitoring methods were chosen and adopted based on simplicity, accuracy and low expense.

A relatively new technique of measuring concentration of *E. coli* and other coliform bacteria was used for the monitoring. Using this method, a one-milliliter sample of water was collected using a sterile, plastic pipette and squirted into a 10ml bottle of sterile, liquid medium. The medium (with color indicators for coliforms) containing the water sample would be poured onto a sterile, plastic dish, which was designed to induce the liquid to solidify. Incubation of sample plates at ambient tropical temperature was sufficient to grow the bacterial colonies for enumeration in about 30 to 36 hours. No incubators, sterilizer, or glassware were needed for this technique and necessary supplies (which cost about $1 per sample) could be easily transported to remote areas for sampling scores of sites per day. Following the incubation period, bacterial colonies of *E. coli* and other coliforms were enumerated and reported for feedback to the community. The same procedures used to monitor coliform bacteria in Lantapan were approved by the US Environmental Protection Agency for the Alabama Water Watch Program in January 2000 (Deutsch and Busby 1999).

Whereas the initial participants in water quality training workshops and monitoring were predominantly young men, bacteriological monitoring generated much interest among young and old women. This param-

eter was believed to be of particular interest to women because of its direct tie to family health, especially that of infants and children. It also might have been more relevant than other parameters because the measurement was made from community faucets and public springs that had a close connection to household affairs and daily chores. Strong involvement from the Federation of Lantapan Women's Organization and other women of the community added a new dimension to community-based water quality indicators and their applications. Overall, the concentration of coliform bacteria has become an important indicator of water quality, used by diverse sectors of the community.

Appendix Table 1. Average discharge, range and coefficient of variation of four tributaries of the Manupali River

Stream	Position in Watershed	Discharge (cu. m/s) Average	Low	High	CV (%)
Tugasan	Highest	1.78	0.26	3.84	51
Maagnao		1.92	0.77	3.40	32
Alanib		1.29	0.13	2.93	60
Kulasihan	Lowest	1.84	0.00	10.26	140

Note: Measured monthly on the same day, February 1997-October 1999.
Source: Deutsch et al. (2001a).

Appendix Table 2. Summary of community-based water quality indicators

Issue/Problem	Indicator	Unit of Measure
General environmental degradation	Community perceptions, memories, experiences	Anecdotal or questionnaires/ surveys
Soil erosion	Suspended soils in water	Mg/L TSS
	Soil loss in water	Kg/h soil export
Disrupted stream flow	Stream discharge	Cu. meters/second flow (monthly measurement)
	Flow variability	Coefficient of variation
Bacterial contamination	Coliform concentration	No. colonies/ml of water (*E. coli* and other coliforms)

Source: Deutsch et al. (2001a)

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9 Iloilo Watershed Management Council: a local initiative in watershed management

Jessica C. Salas

Introduction

The degree of readiness to accept the devolution process and its accompanying responsibilities varies among local government units (LGUs). Numerous factors in this regard tend to challenge the LGU executives' managerial capability.

One area where the principle of devolution has not gained much ground is watershed management. This arises from a limited understanding of the concept of watersheds. Watersheds are generally associated with mountainous forests, and so are believed to be located only in such areas. Several of government's pronouncements and policies tend to reinforce this understanding of a limited watershed that is confined to forestland.

Meanwhile, LGUs take the brunt of issues and problems related to watershed degradation such as landslides, flooding, low productivity, nonavailability of water, poor quality of water and problems arising from conflicting uses of water. In this regard, a large part of the watershed may be classified as alienable and disposable, or agricultural or residential (or both), lands. Several municipal or barangay units of the local government could in fact be found in one stretch of a river basin, or within a watershed. In which case, much of the population in these areas may have suffered from the adverse consequences of a degraded watershed. Thus, decisions regarding watershed affairs should go beyond reforestation efforts in the upper watershed to cover other concerns affecting areas under the jurisdiction of LGUs.

However, no government agency provides an integrating perspective on land and water. While there are government agencies whose areas of responsibility involve or cover locations in the wider and lower portions of a river basin or watershed, they are not concerned with these water resources—the concept that connects land and water resources to be conserved—in their conservation efforts except in coordinating relevant activities with the DENR. Although attempts were made in the past to create centrally funded and controlled river basin authorities, the constraint of funding and the scale of management concerns seriously limited the expansion and development of these endeavors.

This kind of situation is understandable in light of the public's, and even government's, restricted notion of the concept of watershed. For instance, the Department of Agriculture (DA), which is concerned with the availability of water for farmers, focuses on the utilization of water for irrigation through the National Irrigation Administration (NIA) while the production of water is the responsibility of the DENR.

LGUs, given their resources and more ground-based knowledge of the issues affecting the watersheds and river basin in their respective areas, play a critical role in the conservation and management of watersheds. Even Republic Act (RA) 7160, better known as the 1991 Local Government Code (LGC), recognizes this role. Despite the deficiency in the macro structure, the LGC contains provisions that should empower LGUs to exercise authority over the use and conservation of watersheds and water resources. All that is needed are information- and creativity-enhancing activities.

On top of this, an inherent advantage among LGUs is their influence and command in balancing use and conservation—a basic task for maintenance of any ecological system—as they deal with their constituents. A responsible local government with ample authority can effectively manage this delicate balancing act.

Despite all the technology at its command, a central government agency could easily get lost in the social and cultural complexities of communities. In the long run, police powers and penalties alone may not be enough to assume the role that is best carried out by LGUs, as has been the experience in the implementation of several laws (Rola et al. discuss this issue in Chapter 8 of this volume).

Local Government Code: foundation for local action

The LGC has laid the foundation for local initiatives relating to environmental management. As explained in the previous chapters of this volume, the LGC transferred the relevant responsibilities and powers to LGUs (Table 1). The challenge lies in how the LGUs will make use of them.

Table 1. Summary of environmental management functions and powers of LGUs based on the LGC

Function	Power
Conserve natural resources	• Adopt measures to safeguard and conserve natural resources, lands, minerals, marine resources, forests, among others. • Protect inhabitants from harm due to manmade or natural disasters and calamities. • Protect the environment and impose penalties for acts that endanger the environment such as dynamite and destructive fishing; illegal logging and smuggling of logs; smuggling of natural resources products and endangered species; slash-and-burn farming and pollution-causing activities; acceleration of eutrophication of rivers and lakes or of ecological imbalance. • Grant exclusive privileges for constructing fish corrals or fish pens or catching of *bangus* and prawn fry, or *kawag-kawag*, or fry of any fish within an LGU jurisdiction. • Establish, maintain, protect, and conserve communal forests (or forests less than 5000 hectares) and watersheds, tree parks, greenbelts, mangroves, and other similar forest projects.
Undertake waste management	• Provide for an efficient and effective system of solid waste and garbage collection and disposal; prohibit littering , placing, or throwing of garbage, refuse, and wastes. • Require good sanitation practices. • Regulate the disposal of the wastes of hospital and other business establishments.
Protect air and water quality	• Protect the purity and quantity of local water supply. • Regulate the use of water. • Establish, maintain, protect, and conserve tree parks and greenbelts.
Regulate land use	• Adopt a comprehensive land use plan for the LGU. • Reclassify lands within the LGU boundaries. • Enact comprehensive zoning ordinance.

Source: Governance in Local Development (GOLD) Project, Final Environment Report, December, 2002.

Iloilo Watershed Management Council

The case of the Iloilo Watershed Management Council (IWMC), a multisectoral local body created by the Iloilo provincial local government through an ordinance, illustrates how these powers mandated by the LGC may be used. It also illustrates the power of information sharing, based on credible and informed data, in attracting the interest, support and involvement of the local communities.

Background

On October 2, 2000, the provincial government of Iloilo passed Ordinance No. 2000-41 creating the IWMC, which would look into the province's watersheds and take responsibility for their conservation, development, utilization and protection. The Council would also be responsible for creating instruments/mechanisms that would resolve conflicting interests and balance numerous demands with the carrying capacity of the resource; promoting awareness; and seeking resources to enhance institutional strength, manage weaknesses, and avoid threats to the watershed resources.

The provincial ordinance also empowered the IWMC to create watershed boards that were also multisectoral bodies and which were tasked to look into the management of specific watersheds to which the member municipalities belong. So far, three river, or watershed, boards have been created and 12 others, representing clusters of rivers or branches of larger river basins, have been identified. This arbitrary clustering will have to be studied and accepted by the municipal units of the local government.

The watershed boards created were:

- Tigum-Aganan Watershed Management Board;
- Magapa-Suage Watershed Management Council; and
- Sibalom-Baguingin Watershed Management Board.

The creation of the IWMC sealed 13 years of efforts of defining and building multisectoral and multitiered groups of stakeholders within the province to address problems and issues. Such efforts began with the objective of reforesting and rehabilitating the upper Maasin watershed, located within the Tigum-Aganan River Basin (described in detail later).

In setting up the IWMC or the Council, the Iloilo provincial government invoked, among others, certain provisions of the LGC and the Phil-

ippine Agenda 21 (PA 21), which considers development sustainable when: a) communities stimulate the local economy; b) there is partnership among sectors like business, government and civil society; and c) development is anchored on natural systems. The LGU likewise invoked Memorandum Order No. 399 dated September 26, 1996, which directed all government agencies and LGUs to realign their plans and policies with PA 21, and Memorandum Order No. 47 dated January 20, 1999, which directed LGUs to formulate and implement their respective sustainable integrated development plans.

Mobilizing a local watershed management structure

IWMC began to take shape when the Iloilo City residents realized that the upland portion of the watershed in Maasin was being farmed and was without trees. A 1992 feasibility study cited that only 7 percent of the reserved upland watershed had old growth trees.[1] This sparked a debate among the people on how best the upland watershed could be reforested. The ensuing debates were carried on in civic club meetings, development council assemblies, schools, local news, and even kiosks and bars.

Several sectors opposed the study's recommendation to the Regional Development Council (RDC) that social agroforestry should be the strategy for the rehabilitation of the Maasin Watershed. When he assumed office, Governor Arthur Defensor declared that the policy should be: "Trees should coexist with people." Thus a task force was created on the Rehabilitation of Maasin Watershed (which eventually became the Iloilo Watershed Management Council). It formulated rules that sought to balance protection of trees and the livelihood of the people. Ordinances were passed by the municipal LGU to implement the agreements at the Task Force.

The task force was able to mobilize funds and conduct an annual planting activity personally led by the governor to underscore the need to protect the watershed. Five hundred hectares were replanted from the fund contributed by the city folk. Upon the request of the governor, the DENR released P3 million from its general fund to facilitate community organizing from 1992 to 1994. In 1995 the DENR Forest Sector Project,

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[1] Feasibility Study of the Rehabilitation of Maasin Watershed by Kahublagan Sang Panimalay Foundation, 1992.

which was created to rehabilitate the watershed, obtained a site development fund for another 3,500 hectares through a loan from OECF (now the Japan Bank for International Cooperation or JBIC).

The task force, which had been meeting regularly as early as 1991, took a back seat to the DENR's Forest Sector Project, in deference to the government's central agency responsible for the rehabilitation of watersheds. The task force met only once a year beginning in 1995 until 1998 to get an update on the project. DENR, following the setting up of the Project, contracted the services of a federation of people's organizations organized by a nongovernment organization (NGO) called *Kahublagan Sang Panimalay* (Community Movement) Foundation. The federation was called *Katilingban sang mga Pumuluyo sa Watershed sang Maasin* (organization of communities in the watershed) or KAPAWA-Maasin. The acronym KAPAWA literally means "the light." KAPAWA has been a member of the Task Force and represented the upland communities in the Upper Tigum watershed even after the Task Force was changed into the IWMC.

The two-year contract between DENR and KAPAWA which ended in 1997 resulted in the establishment of a plantation. In the same year, the contract of *Kahublagan*, the NGO contracted by DENR to build the capacity of KAPAWA in managing the establishment of the plantation, also ended. DENR then created the SuSiMo (Subproject Site Management Office) to supervise a second contract with KAPAWA for plantation maintenance for another five years.

At the end of its contract, *Kahublagan* reported several unresolved issues. These were: a) the lack of food security program for the people who have been economically displaced as they could no longer farm inside the watershed; b) nonoperationalization of the Protected Area Management Board (PAMB) nor the Project Management Board, or any other body that should have monitored and evaluated the progress and impact of the project;[2] and c) nonissuance of a Community-Based Forest Management Agreement, which could have ensured the implementation of a socialized agroforestry scheme.[3]

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[2] The creation of a Project Management Board was stipulated in the contract with *Kahublagan* as a body that will promote transparency and encourage participation in the project.

[3] It should be noted that while there was an early opposition by the city folk to this scheme, the socialized agroforestry scheme was approved by the Regional Development Council as indicated in the Feasibility Study for the Rehabilitation of the Maasin Watershed.

Because of these issues, the task force was revitalized. It then started meeting again regularly until an ordinance was passed converting it to the Iloilo Watershed Management Council in October 2000.

IWMC: an analytical perspective

How did the IWMC respond to the various issues and concerns affecting watershed management and protection in Iloilo City? To answer this question, it will be helpful to examine and analyze it from four points: a) scale and scope, b) structure, c) governance, and d) functioning.[4]

Scale and scope

The *scale* or size of the watershed is an important element in mobilizing a multisectoral group, because it defines the span of control, extent of influence, and area of operation of that group. In the case of Iloilo, a medium-sized watershed, as defined by the DENR (Table 2), became the experimental base. This was the 297 sq. km. watershed of the rivers of Tigum and Aganan, or the Tigum-Aganan watershed (Figure 1). These are the two big rivers that converge at Jaro River before they enter Iloilo City.

The Tigum-Aganan watershed attributes 104 sq km of its 297-sq-km size to the Aganan watershed and 193 sq km to the Tigum watershed. The public forest land covers 11,250 ha; alienable and disposable land 18,250 ha; forest covers 40 sq km; brushland 195 sq km; rice paddies 17 sq km; and other crops 41 sq km.[5]

Table 2. Definition of catchment[a] scales (in sq km)

River basin	Over 1,000	Interregional
Large watershed	500 – 1,000	Regional, interprovincial
Medium watershed	100 – 500	Provincial
Small watershed	10 – 100	Provincial/municipal
Micro watershed	Under 10	Municipal/barangay

[a] Based on DENR's definition, *catchment* is interchangeably used with the term *watershed*. See the definition of terms in Chapter 1, this volume.

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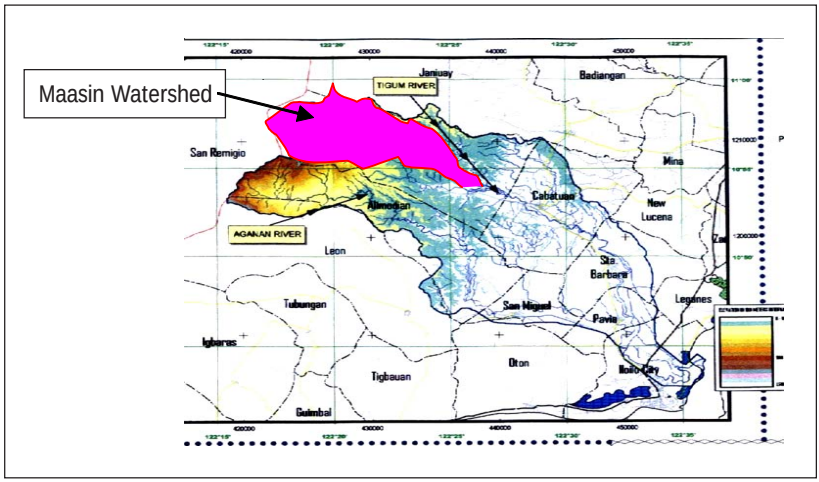
[4] Salas 2003.

[5] The National Mapping and Resource Information Authority (NAMRIA) digital map. Interpreted with ground familiarization by Engr. Ronnie Jagorin, NIA Region VI; and members of the Technical Working Group of the IWMC.

Figure 1. The Maasin watershed's (not in scale) location related to the Tigum-Aganan River basin



The watershed divide covers eight municipalities and one city, namely, Maasin, Cabatuan, Sta. Barbara, Pavia, Leon, Alimodian, San Miguel, Oton, and Iloilo City. A total of 309 barangays are located inside the watershed (Table 3).

Soon, the Tigum-Aganan Watershed Management Board was discussing issues of concern during its meetings. Other issues were elevated to the IWMC. And since the meetings were adequately covered by media, issues were carried over into the full view of the community as they were written on local papers and aired over radio programs, TV news and sitcoms.

The *scope* of discussion of issues in the meetings covered not only reforestation matters in the upper watershed but also quarrying, groundwater mining, flooding, and conflicts in the competing uses of the water resources. People-centered issues like health, livelihood, waste management, quality of life, and the relationship of the residents to land and water became regular topics of discussion. Among the city folk, the dictum "plantation is the enemy of the watershed" was widely discussed.

Interest in these discussions grew as these were aired over the radio by Kahublagan as part of its school on the air, aimed to reach everyone in the upland. The school was organized to make up for Kahublagan's in-

Table 3. List of barangays in Tigum-Aganan watershed[6]

Municipality	Barangays inside the watershed		Barangays outside the watershed		Total
	No.	%	No.	%	
1. Maasin – upland	49	98	1	2	50
2. Alimodian – upland	52	85	9	15	61
3. Leon – upland	9	11	76	74	85
4. Cabatuan – lowland	68	100	0	0	68
5. San Miguel – lowland	24	100	0	0	24
6. Sta. Barbara – lowland	50	83	10	17	60
7. Pavia – coastal	17	94	1	6	18
8. Oton – coastal	17	46	20	54	37
9. Iloilo City – coastal	23	13	157	87	180
Total	**309**	**53**	**274**	**47**	**583**

ability to go directly to the communities to mobilize them owing to lack of funds. The response to the radio program was so overwhelming that it soon reached the no. 1 and no. 2 slots on the AM and FM bands, respectively.

This development shows that the people living in the watersheds were not only concerned with reforestation efforts but also with other issues affecting the upland or upstream population. The scope of their concerns was therefore not limited to reforestation.

Structure

The IWMC follows a multitiered, multistakeholder approach to governance (Figure 2). Watershed boards/subcouncils under the auspices of the Council manage their respective watersheds within the province. These are the Tigum-Aganan Watershed Management Board, the Magapa-Suage River Council, the Sibalom-Baguingin Watershed, and the upcoming Barotac Nuevo rivers watershed.[7] The two-level *structure* is supported by municipal substructures and sets of corresponding responsibilities (Table 4).

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[6] Kahublagan Sang Panimalay Foundation Report, Tigum-Aganan Watershed Board Strategic Plan, 2003.

[7] The IWMC, with its partner NGO, the Kahublagan Sang Panimalay Foundation, continues to implement the training in Community-Based Integrated Watershed Management for the other watershed boards.

Figure 2. Organizational structure of the Iloilo Watershed Management Council

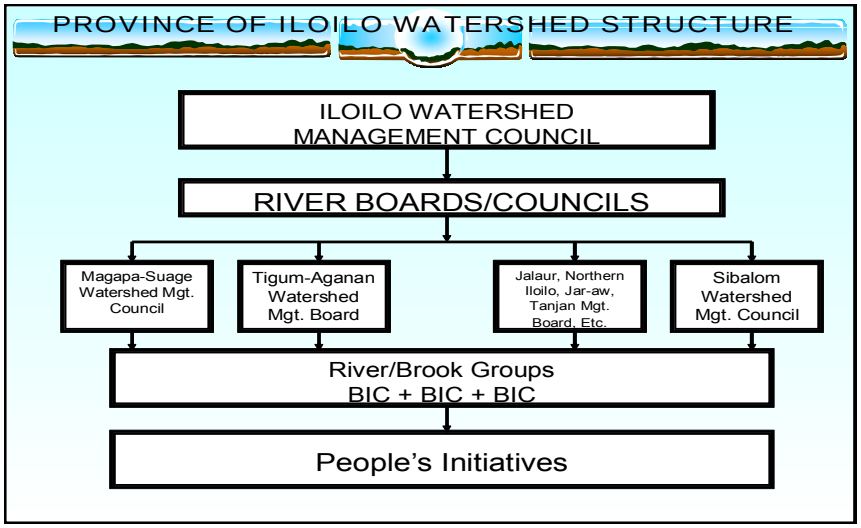

Table 4. Multilevel structure of watershed management

Area	Managing Body	Responsibility
Regional	Regional Development Council Water Committee of Region VI[a]	Monitoring and evaluation of water programs, policy advocacy, information dissemination, and support for the creation of multisectoral watershed management groups in the region.
Provincial	Iloilo Watershed Management Council (IWMC)	Policy formulation, fundraising, actuation, networking.
Watershed	Watershed Management Board	Planning, actuation, technical application, decisionmaking, programming, watershed monitoring and evaluation.
Municipal	Municipal Watershed Council or the watershed core group[b]	Implementation, participation in planning, consolidation, facilitation of technical services and information dissemination to barangays.
Barangay	Barangay Information Center	Provision of information to people's initiatives, whether individual or group. Conduct of community mapping and water planning exercises.
Households or the neighborhood	People's Initiative	Participation in community mapping, water planning. Access of information, demand for technical services. Decision and initiation of action.

[a] Created on June 5, 2003 under the Regional Sustainable Development Council.
[b] The core group is used for informal steering groups in municipalities that have not yet legalized their councils.

In terms of composition, the IWMC has 15 members, namely: a) the Sangguniang Panlalawigan Committee on Environment of the province of Iloilo, b) League of Municipalities, c) City of Iloilo, d) SP committee on environment, e) National Irrigation Administration (NIA), f) Philippine Information Agency, g) Metro Iloilo Water District (MIWD), h) Department of Public Works and Highways (DPWH), i) Department of Agrarian Reform (DAR), j) Department of Education (DepEd), k) National Economic and Development Authority (NEDA), l) Philippine National Police (PNP), m) Iloilo Business Club, n) Kahublagan Sang Panimalay Foundation, and o) KAPAWA-Maasin. A proposal to reconstitute the Council to clear it of its legal infirmities is currently with the legal office of the province.

The watershed boards, on the other hand, are composed of the local chief executives of municipalities within the boundary of the watershed, plus representatives from the academe, irrigators' association, water district or water association, business groups, NGOs, people's organizations, and river quarry associations. As the internal rules and regulations improve, the boards may expand the membership and turn it into an assembly of stakeholders electing an executive board.

For staffing, the office serving as secretariat of the IWMC in 2000 and 2001 was the Provincial Environment and Natural Resource Office of the LGU of Iloilo province. Upon assumption to office of Governor Niel Tupaz, the Council's secretariat was transferred to the office of the provincial administrator. Meanwhile, the source of technical advice to the IWMC is the Technical Working Group (TWG) composed of the DENR, NIA, DPWH, Kahublagan, DA, DAR and MIWD. The NGO Kahublagan serves as the secretariat of the Tigum-Aganan Watershed Management Board.

Governance

There are various aspects to the IWMC's system of governance, namely:

a) *Authority*. The authority of the watershed boards to govern rests on the mandate of the IWMC and the inherent functions of LGUs. The watershed is governed by the resolutions of the IWMC as the policymaking body and by the boards' decisions. Based on such authority, for example, the Tigum-Aganan Watershed Board has developed its Watershed Plan

for 2003–2005, which is reviewed and enhanced by a team of consultants for the flood project of Iloilo. The Magapa-Suage Board also has its own action plan and has recently published a textbook on watershed management adopted by the DepEd.

b) *Regulatory power*. The regulatory power of the watershed board rests on approved resolutions implemented by the member municipalities. An office staff called Watershed Point Person of each municipality comprises the TWG of the board. This group works closely with the TWG of the IWMC. A point person links the watershed board with the Municipal Watershed Council.

Aside from the top-down mode of regulation, the people's initiatives (as shown in Figure 2), encouraged by a continuing education program, could initiate compliance from their own groups and with a resolution at the barangay level. Although this concept of regulation is quite nebulous considering the voluntary nature of the initiatives, it becomes effective once everyone understands the purpose of the proposed environmental initiatives. For example, apart from the encouragement of the DA and its training in pest management, the church groups and several community-based NGOs worked effectively for the adoption of the Integrated Pest Management (IPM) and organic rice and vegetable farming. This movement gained considerable headway as it was reinforced by appropriate messages from the school on the air described earlier.

Another example of citizen and voluntary initiatives was the effort to plant the right tree species (instead of exotic ones) in the area. Reinforcing this activity were continuous information, education and communication (IEC) efforts. Soon, people realized that it was not enough to plant trees; choosing the right species to plant was even more important. For example, one watershed management group, the Sibalom-Baguingin River Board, vowed not to plant gmelina and mahogany trees in its headwaters and instead encouraged the residents in its area to plant harvestable trees on farms and endemic species in forestlands.

This case shows that the regulatory power of a national agency, through watershed-related policies, may either be reinforced or held ineffective by an active community, fully aware of what the latter wants to achieve through IEC. However, IEC is only a supplemental function to regulatory mechanisms. Consultations with the affected community are among the measures to determine its collective problems and aspirations.

Other measures can be informal, which oftentimes can be more effective and easily carried out by LGUs, given their proximity to their constituents. This is their inherent advantage over national agencies.

c) *Decisionmaking*. The multisectoral board is seen to provide a broad local community perspective. It is a potential vehicle for highlighting local knowledge about land and water and culture of the natives that may help middle-level executives of government agencies pursue national policies meaningfully and effectively at the local level.

What happened to Iloilo is a case in point. The proposal to adopt a socialized agroforestry scheme at the Maasin watershed was met with resistance by the people in the absence of a local multisectoral body that could have advised the proponents from the national government on how best they could implement the plan without antagonizing the community.

The RDC was not an effective venue to resolve the prevailing issue at the time, as it did not even attempt to do so. While the RDC is considered a multisectoral body, its power still emanates from the line agency executives that have a mandate from the central government to fulfill. On the other hand, a multisectoral body under the devolved local government code has a separate power source and could have conveyed the people's voices to the proponents.

d) *Literacy*. The crux of the matter in community mobilization is the literacy of both decisionmakers and the participants about the issues at hand and the decisionmaking process. Watershed literacy is the substance of an effective multisectoral council; its undeveloped state could be an obstacle to the Council's functioning. A multisectoral body, though vested with powers by the LGC, could be dangerous without ample knowledge and information. As such, carefully planned IEC activities are considered very important. Sophisticated IEC programs that require considerable resources are ineffective if they do not raise the level of literacy of the target audience.

In the case of the IWMC, the school on air program of *Kahublagan* was adopted. Its IEC efforts consisted of a 30-minute radio program simply titled "School on the Air." Its message was very clear—that education does not happen when there is no action. The IWMC also made sure that it conveyed information to enhance a) understanding of alternative uses, b) incentive structures, and c) participatory protection of natural resources to reduce pressures in using ecologically fragile lands.

One area of concern where the need for an IEC campaign is evident is the sedimentation in rivers or water quality in the watershed. The source of pollution is a nonpoint source, and no single regulation could stop this form of pollution, especially in the Philippine context, if there is no real and functional environmental literacy program in the area.

Evaluation of IWMC as an institution has revealed a lack of support to IEC. On its fifth year, the IEC program was stopped due to lack of funds. The apparent nonsupport of the LGUs to the program was attributed to the upcoming elections at the time, which took up much of the resources that could have been spent for the program. This is an institutional weakness that has to be resolved in the next round of IWMC meetings.

e) *Scientific data generation and information dissemination*. Crucial to informing and educating the people on issues is the availability of scientific data for understanding, managing and monitoring the health of the watershed. The TWG of the IWMC has technical people from the DENR, NIA, DPWH, DOH, DA, and other agencies. The Department of Science and Technology is also available for consultation. Reading materials are accessible from the international community as the NGO member participates in international fora like the World Water Forum and the Stockholm International Water Institute Conferences, and is a member of the Global Water Partnership and the International Rainwater Catchment Systems Association. The present Flood Project of Iloilo aims among others to study sedimentation and review the watershed management plan of the Tigum-Aganan Watershed Management Board. Experts' scientific input will enhance the board's plan.

Management functions

As earlier mentioned, the overall goal of the IWMC is to oversee the implementation of an Integrated Watershed Management Strategy in the Province of Iloilo under an equitable, sustainable, multiple-use, demand-driven, and participatory development. To achieve this, the Council must undertake the following functions:

- Facilitate the formulation, integration and adoption of a Comprehensive Management and Development Plan covering all watersheds in the province.
- Oversee and monitor development activities, programs, and

projects concerning the conservation, development, protection, and rehabilitation of watersheds in the province.

- Provide a legal framework for the rationalization of the watershed management in the province and legislative support for watershed management programs in terms of executive orders, ordinances, and resolutions.
- Generate revenues and undertake fund-raising activities in support of the operations of the Council; and assist other concerned LGUs in developing and marketing investment packages for watershed development and management.
- Obtain technical and logistical assistance from national government agencies, international organizations, and the academe for the implementation of the Integrated Watershed Development Plan.
- Supervise the activities of a Provincial Technical Working Group on Watershed Management.
- Assist in the creation and establishment of Local Watershed Management Councils in identified watershed planning units in the Province of Iloilo.
- Reconcile conflicts between and among watershed stakeholders, which cannot be settled within the Local Watershed Management Councils.

The successful undertaking of the above functions is premised on certain factors, namely: (a) planning, (b) leadership, and (c) financing.

Planning

As shown in the organizational structure of the IWMC, there are watershed boards for specific watersheds encompassing certain municipalities. One of these is the Tigum-Aganan Watershed Management Board whose framework plan is shown in Box 1.

The management plan is important not only in addressing issues on conflicts that may arise in the watershed but also in setting directions and integrating the plans of various LGUs toward a common vision.

The extent to which the goals of watershed management are accomplished is evaluated using success indicators adopted by the IWMC from the guidelines set by the Philippine Watershed Management Coalition (Box 2).

Box 1. Framework plan of the Tigum-Aganan Watershed Management Board

Vision Statement
A habitable and productive Tigum-Aganan Watershed sustained and protected by well informed LGUs and empowered communities working in harmony towards an improved quality of life.

Mission Statement
We commit to work together, develop our capabilities, pool resources, effect policies, network and advocate initiatives for watershed protection, rehabilitation and management.

Objectives:
- To protect the forest and to increase vegetative cover. (Forest)
- To promote and practice environment-friendly technology in agriculture; conserve water and soil; and promote "food for health" of the people. (Agriforest)
- To protect the river system through quality water monitoring by the communities.
- To promote continuous education, information, and dissemination that translate into action.
- To improve access to minimum basic needs.
- To draw and promote alternative livelihood activities for communities.

Serving as a guide to the watershed boards in the preparation of a management plan is a comprehensive set of modules included in the training program for its members and staff (Box 3).

The Watershed Management Plan is integrated in the Municipalities' Annual Investment Plan and Annual Development Plan. This is done to ensure that the concerns of the watershed are included in the regular programs of the municipalities. In some instances, they are included in the various sectoral plans and implemented by designated units. However, there is yet no institutional arrangement for the regular monitoring of the watershed.

Leadership

The IWMC has had three governors over the past 13 "experimental" years. Despite the changes in leadership, the IWMC has continued to work toward its goal, being a community with a common stake—the protection of the watershed as its source of water and livelihood—which was made clear to everyone at the outset. This watershed-based approach to

Box 2. Watershed management impact indicators

Poverty is addressed in watershed communities.
- ❍ Alternative livelihood opportunities are present.
- ❍ Farmers, fishermen, laborers show improved skills and updated information.

Responsible political and community leadership is present.

Responsive policies and programs are in place.
- ❍ State laws on sustainable watershed management are implemented.
- ❍ Government agencies have a common development framework plan.
- ❍ People are protecting the watershed.

Degraded resources are rehabilitated.
- ❍ Soil and water measures are practiced.
- ❍ Safe and sufficient water is available.
- ❍ Land productivity is restored and cared for.
- ❍ Pressure groups are organized to protect the resources.
- ❍ Biodiversity is appreciated and increasing.
- ❍ Ecological waste management is practiced.

Success indicators (project outputs)
- Watershed concerns included in the Annual Investment Plan (with budget, personnel, organization)
- Ordinance support
- Operational management body—e.g., Watershed Council, a multisectoral council, PAMB, PMRB, etc.
- Community partnership
- Land use plan in place with watershed management plan/ forest land use plan
- Appropriate farm practices
- Reduction in illegal/ destructive resource use
- Increased resource reinforcement activities (such as tree farms, rainwater harvesting, etc)
- Alternative livelihood options for upland dwellers
- Increased number of groups implementing watershed activities/ membership in coalition

management has been credited for the Council's ability to focus on its primary objective notwithstanding who is at the helm.

Thus, messages like "We all live inside a watershed" and "There is the good, the bad and the ugly; with the good referring to a sustainable watershed, the bad referring to a degraded watershed, and the ugly referring to our ignorance on which one we live" have been taken seriously by everyone concerned, as could be gleaned from their unwavering commit-

Box 3. Training modules for Community-based Integrated Watershed Management

- Area delineation
- Establish institutional mechanism
- Watershed Framework Plan
  - Vision-Mission-Objectives
  - Impact indicators
- Watershed characterization
  - Barangay community mapping
  - Barangay water planning
- Strategic planning
  - Consolidation of community maps
  - SWOT exercise
  - Consolidation of water plans
  - Identification of the central strategy and programs
- Integration of the Watershed planned activities with the municipal Annual Investment Plan and Annual Development Plan
- Monitoring and evaluation
- Information Education Communication

ment to the goals of the IWMC. Sustained IEC efforts have also made this kind of response possible.

Financing

The IWMC lacks funds to run its machinery and successfully pursue its objectives. Although the ordinance that created it assured it of a P1 million appropriation, this fund has not been released. Only small amounts have been set aside for activities like meetings and assemblies. Funding for training and secretariat work came from *Kahublagan*, using the amount set aside for its research project. The municipalities, on the other hand, fund their own councils and watershed point persons as well as their watershed activities.

What could have helped finance the planned watershed activities was the MIWD. But this never happened.

A look into the background of this development could help one understand the MIWD's decision.

Prior to 1994, the MIWD obtained a franchise to use the water resource of the Maasin watershed, which had been declared as a reserved

watershed in 1923. The franchise appointed the MIWD to be the caretaker of the watershed. Owing to the reported political interventions, the MIWD could not successfully protect the entire 6,150 hectares from intruders. Based on the 1992 data generated from the Feasibility Study of the Rehabilitation of Maasin Watershed, about 10,000 people were tilling their farms in this reserved area of the watershed despite the fact that only about 120 housing structures were found there.

The MIWD eventually launched a series of awareness campaigns, including the construction of billboards across the city, to warn the people that by year 2000, the Tigum river would not have enough water even for drinking.

The NGO community responded by coming up with a "Save the Maasin" movement while the provincial government convened the task force, which included the DENR, MIWD, business representatives, civic clubs, and NGOs. For their part, the people contributed money for the reforestation of about 500 hectares of the Maasin watershed. The MIWD assisted the rehabilitation effort by releasing about P2 million over a period of two years. The results of the implementation of the project, however, did not meet its expectations.

On the third year, MIWD was urged by the council to channel its funds to the newly created IWMC to strengthen the management of the Council. Because of its unhappy experience in the past, MIWD refused. Thus the IWMC members grappled with financial problems.

Conclusion

The IWMC has gone through various phases and tests. To this day, it is still beset by issues and concerns that need to be addressed. In the process, it will continue to evolve.

Here is a list of the prevailing challenges that IWMC must meet head on:

a. *Leadership structure*. Will the local chief executives, for instance, continue to support the goals of IWMC? What will happen to the Council if the next sets of leaders are no longer interested in managing the watershed as others have done in the past?

If the multisectoral group's ability to survive the three changes in administration at the provincial level is anything to go by, the prospects for its continued existence may look bright. Yet, the strength of the lower

rung of the structure rests on a critical mass of followers committed to protecting the watershed.

Amid the changes in leadership, the NGO facilitator persisted in providing information to the LGU and its constituents,[8] without which the communities would have had no basis for a collective action to uphold the structure that would preserve the watershed.

b. *Accountability in governance*. This remains to be a weak point of the institutional structure of the IWMC. Thus there have been proposals to include sanctions in the ordinance that created it so that Council members found to have been remiss in their duties could be dealt with accordingly. Another suggestion was to register the river or watershed management boards as quasipublic corporations to make them accountable for their decisions and actions. None of these proposals have been carried out so far.

c. *Funding constraints*. This factor remains a major concern in light of the Philippine government's having incurred a P51-million loan to fund a rehabilitation project of the Maasin watershed. The fund went to the rehabilitation of a portion of the watershed and the administration of the plantation. The multisector groups, the IWMC and the river boards, on the other hand, lack funds to implement the Watershed Management Plan.

d. *Sustenance of IEC efforts*. Where this issue is concerned, the challenge for the IWMC, through either its NGO partner or the people's organizations within its structure, is to pursue its IEC campaign, making sure it reaches all the local communities within the watershed.

Lessons learned

The IWMC has three key lessons to learn from its experience.

One is the importance of a continuing and relentless IEC program for all the communities and all stakeholders involved, covering all issues related to the watershed and backed by hard and scientific data. Starting with messages such as "We all live in a watershed" and accompanied by creativity-enhancing initiatives, the IEC efforts were able to impart to the

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[8] "Hydrosolidarity: Managing Upstream-Downstream Concerns of the Watershed," a project of Kahublagan Sang Panimalay Fund funded by The Ford Foundation, 2000-2003.

populace a real understanding of the concept of a watershed and how it functions. Supported by scientific data and experts' analyses, the information relayed and discussed was not simply based on speculative information and hearsays but on hardcore facts and analysis.

Two, which is very much related to the above, is the significance of informing the people of the link between land and water resources. Through the Council's IEC efforts and consultations, the impact of land use upstream or in the upper watershed on the downstream communities in relation to water supply and water quality was clearly explained to the people.

In response to these efforts, the people participated in projects and activities addressing specific issues relating to this linkage. Thus, decisions affecting the management of the watershed went beyond reforestation in the upper watershed and included concerns affecting lowland communities like floods, erosion, pollution of water supply, waste management, and health of the people.

Finally, Kahublagan could not have thought of a more appropriate message to convey to the people in the initial phase of its community organizing work: "Forests are not only trees. Take care of the people and the trees will follow." With this message, it focused attention not only on reforestation but also on the people's basic welfare and education needs.

Annex A
Recent developments in the IWMC

As of this writing, a number of developments have taken place within the Council that may help resolve the challenges that continue to face it. For instance, in a review of the provincial ordinance that created the Council, amendments were proposed on specific issues:

1. Membership of the Local Government Unit of Iloilo City in IWMC created by the provincial ordinance of Iloilo Province: Do not include LGU-Iloilo City but create another instrument for its participation. This proposal was disapproved by the body.

2. On the representatives of the head offices of agencies in the Council: Since the directors, managers, and mayors could not attend the meeting regularly, they should designate a permanent representative to act and decide on their behalf.

3. Inclusion of the names of members in the ordinances and executive orders to be issued: Do not indicate the names of the heads of offices, only the names of the offices.

Amendments to the MOA, meanwhile, were proposed as follows:

1. Membership in the Tigum-Aganan Watershed Management Board: Include LGU-Oton and private sectors such as the Aganan Federation of Irrigator's Association, Pavia Business Club, Women of the Watershed, Garden Club, Quarry Association, Rotary Club and Iloilo City Urban Poor Office.

2. Meetings and quorum
   - The Board shall meet at least once every quarter, specifically on the 3rd Friday of the last month of the quarter. Special meetings may be called by the Chairperson or by a majority of the board members.
   - The Chairperson may call a meeting. In the absence of the Chairperson and the Vice-Chairperson, the Secretary or the Chairperson of the Technical Working Group may call a meeting.
   - Members can appoint a permanent representative to the regular meetings.
   - The minutes of the meetings of the Council and any decisions

made therein shall be duly recorded, copies of which shall be provided to the members.

- A simple majority of the Council's members shall constitute a quorum.

3. Technical Working Group (TWG)
   - The composition of the TWG shall be expanded to include representatives from the LGUs, DENR, DPWH, NIA, MIWD, academe, irrigator's association, business associations, NGOs, and people's organizations (POs).
   - The TWG Chairperson chosen from among the members shall head the TWG and shall act as an ex-officio member of the Board.
   - The TWG shall act as Board secretariat.
   - The Secretariat shall set up an office either at the Provincial Environment and Natural Resources Office (PENRO) or the Provincial Planning and Development Office (PPDO) and shall be accessible to the Chairperson and other members of the Board.
4. Compensation and Remuneration
   - The Chairperson, Vice-Chairperson, members of the Board shall perform their duties as such without compensation or remuneration.
   - Members thereof shall be entitled to necessary traveling expenses and allowance chargeable against the funds of their office.
   - Members of the TWG shall be entitled to necessary traveling expenses and allowances chargeable against the funds of their respective offices.
5. Funding of the operation and projects of the Tigum-Aganan Watershed Management Board
   - LGU members shall allocate 1 percent of their annual IRAs for their watershed management programs.
   - The business sector, NGO, and PO members shall initiate fund-raising activities to generate additional funds.

Annex B
Technical Working Group of the IWMC

Supporting the Council is a Technical Working Group whose members come from agencies helping the tasks of the IWMC. The following are the members stated in the Ordinance:

1. Committee on Environment, Sangguniang Panlalawigan—Province of Iloilo
2. PENRO
3. PPDO
4. Office of the Provincial Agriculturist
5. League of Municipalities
6. City of Iloilo
7. Committee on Environment, City of Iloilo
8. National Irrigation Administration
9. Philippine Information Agency—Provincial Office, Iloilo
10. Metro Iloilo Water District
11. Department of Public Works and Highways
12. Department of Agrarian Reform
13. Philippine National Police
14. Kahublagan Sang Panimalay Fnd., Inc. (NGO member)
15. KAPAWA-Maasin (PO member)

Annex C
Management participation in the Tigum-Aganan Watershed Board

The officers of the Tigum-Aganan Watershed Board are composed of the following:

- Chairperson — Municipality of Maasin
- Vice-Chairperson — Municipality of Pavia
- Secretary — Kahublagan Sang Panimalay Foundation
- Treasurer — Central Philippine University
- Information Officer — Phil. Information Agency, Province

The members of the Board are the following:

- Municipality of Leon
- Municipality of Alimodian
- Municipality of Sta. Barbara
- Municipality of Cabatuan LGU
- Irrigators' Association
- Katilingban Sang mga Pumuluyo sa Watershed-Maasin

All in all, Tigum-Aganan Watershed Management Board has 11 members. The Board is also assisted by a TWG, which consists of the following:

- Protected Area Superintendent, DENR
- Metro Iloilo Water District
- Department of Public Works and Highways
- National Irrigation Administration
- Philippine Information Agency, Provincial Office
- Community Environment and Natural Resources Officer
- Central Philippine University
- Santa Barbara Irrigators Federation
- Katilingban sang mga Pumuluyo sa Watershed—Maasin (KAPAWA-Maasin)
- Kahublagan Sang Panimalay Foundation Inc.

Epilogue

Where do we go from here in terms of the Water Policy Agenda?

Antonio P. Contreras

Three key points have emerged from the foregoing chapters.

One, there is an agreement that there is a water crisis. This point needs no further discussion, as it is already a given and has been amply supported by empirical data, both at the national and local levels.

Two, this water crisis, which is caused by a conjuncture of natural and anthropogenic events and rooted from destructive land-use practices, is aggravated by a flawed governance system characterized by a "soft state." While none of the chapters actually mentioned the term "soft state," it can be safely deduced that the Philippine State is unable to fully implement its laws in water governance, a key characteristic of a "soft" state.[1] The flawed governance system is further aggravated by a flawed science-governance interface. This is particularly seen in the failure of the present legal and policy environment relevant to water governance to work within the parameters of an ecosystems approach wherein the planning unit is landscape-based, or more specifically, focused on the watershed. Furthermore, resource valuation does not take into account market-based mechanisms that will truly reflect the scarcity value of water resources.

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[1] According to Gunnar Myrdal, a soft state is characterized by a situation where laws are formulated in imprecise terms, leading to a situation where a considerable degree of discretionary power is left with government officials. These government officials often cooperate, or "connive," with powerful individuals and interest groups that they are supposed to supervise and control. Thus, the government is easily exploited by powerful lobbies and interests and is incapable of implementing the laws and policies that go against these interests. These interests may even go beyond the powerful groups external to government, but would also include bureaucratic organizations that have large stakes on certain issues. (*Asian drama: an inquiry into the poverty of nations*. Harmondsworth: Penguin, 1968).

And three, while there is a need to strengthen national laws to address the water crisis, the need to empower local government units (LGUs) and communities is clearly recognized.

The prevailing situation

What is the present framework that provides the basis for water governance in the country? And how sufficient is it to address the emerging concerns and issues affecting water management and governance as reflected in the above points?

The following laws constitute the current legal framework for water governance in the Philippines:

- The 1987 Constitution, which mandates that all water resources belong to the State;
- Presidential Decree (PD) 1067, or the 1976 Water Code of the Philippines;
- Republic Act (RA) 8041, or the 1995 Water Crisis Act; and
- Executive Order (EO) 364 issued in 1996, which created the Presidential Task Force on Water Resources Development and Management.

[A more detailed discussion of the legal and policy framework for water is presented in Chapter2.]

The presence of the above legislation and issuances notwithstanding, this volume, as shown in the previous chapters, highlights and points out the absence of mechanisms to operationalize an ecosystems approach and a market-based valuation technique in water resources governance. It is necessary to establish a science-based governance mechanism that supports the institutionalization of both a watershed approach and a market-based valuation system in water resource governance and support their statutory recognition in any form.

Nothing, however, in the existing legal and policy environment prevents governance mechanisms to take up an ecosystems or watershed approach, or operationalize a market-based resource valuation systems. This is seen in a whole range of policies and laws focusing on watershed management like PD 705, as amended by PD 1559 or the Revised Forestry Code, Letter of Instruction (LOI) 917, EO 192, RA 7586 and RA 8041 or the 1995 Water Crisis Act.

These documents, however, all refer largely to the forest ecosystem and the protection of the watersheds' forests, and hardly address other environmental and natural resource concerns that should have been inherent in a watershed approach.[2] Because of this, the critical link between watershed management and water resource management (except in RA 8041) is still largely missing. This is exactly one of the weaknesses of the current Water Code of the Philippines in that it fails to consider a watershed approach in water resources governance.

Meanwhile, the most significant piece of legislation that can put meat into the operationalization of a watershed or ecosystems approach as well as a market-based resource valuation mechanism is RA 7160, or the Local Government Code. This code provides a legal basis for LGUs, either acting on their own or in partnership with other LGUs, to initiate their own resource governance arrangements. In fact, a good number of LGUs have indeed taken advantage of this enabling law to come up with their own resource governance setups, as depicted in Chapters 2 (Francisco), 8 (Rola et al.), and 9 (Salas).

Still, this development needs to be further expanded and broadened by informing or advocating to LGUs about the existence of this enabling basis, or by strengthening and adding to certain provisions in the Local Government Code relating to the promotion and institutionalization of local efforts in watershed management and water governance.

What must be emphasized is that success in the implementation of a watershed or ecosystems approach as well as a market-based valuation mechanism is dependent on the political will of LGUs and their technical capacity. Hence, while national bodies are important, there should be a strong mechanism to enable local bodies to perform their role in watershed management. And any legislation providing for the adoption of a watershed-based approach or a market-based approach can only succeed

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[2] PD 705, amended by PD 1559, or the Revised Forestry Code provided for mechanisms to manage critical watersheds in relation to downstream infrastructure development; LOI 917 of 1979 declared critical watershed and watershed reservations as wilderness areas; EO 192 of 1987 mandated the Department of Environment and Natural Resources (DENR) to be the primary agency responsible for forest management, including watershed management; RA 7586 of 1992 included watershed forest reserves under the coverage of the National Integrated Protected Areas Systems (NIPAS); and RA 8041 of 1995, or the Water Crisis Act, recognized the importance of watershed management in relation to addressing the water crisis. These policies and laws are also summarized in Box 3 of Chapter 2 (Francisco) of this volume.

if there is a strong advocacy and capacity-building component that would enable and support LGU and local initiatives.

The water policy agenda

Considering the above discussions, this volume hereby recommends a policy agenda for water that focuses on legislative actions both at the national and local levels.

Action at the national level

Legislative action is needed at the national level but only in terms of providing a national body that would oversee the integration of all efforts in pursuing the spirit of all existing laws such as the Water Code, NIPAS, Local Government Code, Water Crisis Act, among others. This may entail the revision of RA 1067 (Water Code) to strengthen the integration of the roles of all national level agencies like the National Water Resources Board (NWRB) and the Presidential Task Force on Water Resources Development.

There are two options in this regard.

One is to create a national water body in the form of a Water Commission and in the context of the National Commission on Indigenous Peoples or the National Commission on the Role of Filipino Women.

Two is to lodge the function of overseeing all matters pertaining to water governance in the Department of Environment and Natural Resources (DENR).

However, the issue of whether to create a new body for water that will replace the present NWRB, or to lodge the function with the DENR, while needing to be resolved in the context of both institutional economy and institutional capacity, is already mooted by the decision to eventually transfer the NWRB to DENR. Here, the fear persists that the DENR is already saddled with too many functions.

Despite this eventual transfer of the NWRB to the DENR, and the dissolution of the presidential Task Force on Water, it is still relevant to advocate a balance between a "regulatory" role and an "advocacy" function. This advocacy should lead to a strong capacity-building program for LGUs and other local players to be able to operationalize an ecosystems approach as well as a market-based mechanism. It is also important to

facilitate the strong involvement of civil society actors in water governance.

In this regard, it is worthy to note that an earlier bill filed by a House Representative,[3] a proposed National Water Resources Authority Act, provides for an education and information function that goes beyond a regulatory mode of engagement. Here is a strong incentive for local stakeholders and marginalized sectors, including women, to be involved. This bill, however, has not gained significant progress in the legislative process.

Another bill that has recently been passed in Congress and signed into law by the President on March 22, 2004 is the Clean Water Act. It recognizes the participation of LGUs in the management and improvement of water quality in their respective jurisdictions and provides for citizen action in pursuing suits against violators of the bill's provisions as well as in the conduct of information and education campaign. This bill does not propose the creation of a new water body; instead, it assigns the lead function to the DENR. And while the bill also already refers to market-based instruments, it will greatly help if this bill, in its implementing rules and regulations, can be finetuned to specifically mention a watershed-based approach, if only to provide legal support to a more scientific basis for water resource management.

Based on the above, it is further recommended that the following be considered or addressed by any piece of legislation—either pending or still to be submitted—on water resource management:

1. To include the following policy statements:

a. Adopt an integrated, holistic approach in addressing the inherently interrelated issues of water supply planning and operation, demand management, pollution control, and watershed and groundwater protection.

b. Manage water not only as a social good but more importantly as an economic good. As such, water becomes a commodity that is assessed for its scarcity value and whose distribution exists in the context of market processes, even as it is balanced by the view that water is a basic need.

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[3] Representative Orlando Fua Sr., from the lone district of Siquijor in Central Visayas.

c. Adopt a water-pricing policy that covers the full economic cost of water production and distribution, by taking into account the opportunity cost of water, where there are competing users, and the cost of externalities or negative environmental impacts.
d. Uphold the principles associated with a watershed-based approach by considering the watershed as the basic unit in managing the water resources of the country.

2. To implement the following strategies in the creation of the administrative mechanisms:

a. Emphasize that this should be operationalized along watershed boundaries or river basins.
b. State that watershed is a land area drained by a stream or fixed body of water and its tributaries having common outlet for surface runoff.
c. Include an expert in watershed management in the technical Secretariat.
d. Provide support for the institutionalization of local water bodies such as River-basin or Watershed-based Authorities, following the Laguna Lake Development Authority model.

3. To support the implementation of the following strategies in the establishment of financial mechanisms:

a. Clearly emphasize the use of market-based instruments in assessing the true value of water that would be levied on users, as well as water-related services or damages. This may include raising water tariffs and imposing sewerage charges and effluent taxes.
b. Adopt a socialized system for water-use fees to balance the market-based value with the social nature of water as a public good. This includes setting a threshold value below which water is provided free of charge, and then above which water use is progressively valued.
c. Use a portion of the water use fees for watershed rehabilitation and other restorative mechanisms (e.g., reforestation, vegetative, and engineering measures to control/minimize erosion and siltation) to enhance the quality of water discharged from natural sources. This amount should be clearly itemized and earmarked in the relevant budget allocation process.

Action at the local level

Action is also needed at the LGU level (province, city, municipality, barangay) to establish regional/local bodies such as watershed councils and river basin authorities.

These bodies do not necessarily require national legislation, only inter-LGU legislative action, particularly when watersheds cover different municipalities/cities from different provinces. These bodies may vary in character, charter or nature. In fact, some of them may even be in the nature of cooperatives or NGO networks, or para-statals.

To support this local level action, the national water body should include in its tasks advocacy and capacity-building. This is to create awareness among local players on the possibility for such local institution-building programs and to capacitate them not only to build such institutions but also to be trained in the technical aspects such as the various facets/features of the watershed approach. The national water body should also be tasked to monitor and evaluate these local water bodies.

This should not, however, stop local actors from collectively taking action that would induce Congress to strengthen, through legislative recognition, the local structures. Examples of this include mobilization moves to enact a law that created the Palawan Council for Sustainable Development and the current efforts to enact a law that would create a Davao River Authority.

Final words

Finally, what do all these discussions mean and where do they lead us?

That in all of these, there should be legislative restraint as well as legislative activism, in the form of legislative "economy" and reform. This entails the shifting of focus from regulation to advocacy, and from simply taking stock of existing laws to establishing a "lean but mean" legal environment that allows for local initiatives.

While uniformity and the presence of a super water body might be convenient, it is important to allow for a pluralism of modes in water governance in the country that will enable local stakeholders (LGUs, civil society) to evolve appropriate mechanisms in accordance with local social, political, economic and ecological realities.

Thus, any legislation should contain a progressive element of furthering the spirit of devolution and should provide for the implementation

of the principle of subsidiarity in water governance. This would entail a deliberate transfer of power from national water bodies to local water bodies. Furthermore, this would require the creation of an enabling legal and policy environment that would capacitate and support these local initiatives.

Appendix
Highlights of the Policy Forum on Water Resource Management

12 August 2002, Carlos P. Romulo Hall,
NEDA sa Makati Building
Legaspi Village, Makati City

Moderators: Dr. Mario B. Lamberte, PIDS
Dr. Rogelio Serrano, SANREM

Papers presented

- *Economic Development and Use of Water Resources* by Agnes Rola, Institute of Strategic Planning and Policy Studies, UPLB (with discussion from Vic Abrogueña, Bukidnon Community Development and Resources Council)

- *Watershed-Based Water Management Strategy: The Missing Link to Sustainable Water Services* by Herminia Francisco, College of Economics and Management, UPLB (with discussion from Rex O. Cruz, Environmental Forestry Program, UPLB)

- *Assessment of the Watershed Approach in Natural Resource Management in the Philippines* by Romeo Acosta, Forest Management Bureau (with discussion from Florentino Tesoro, Department of Science and Technology)

- *Competing Uses of Water in the Philippines, with Laguna Lake, Angat, Batangas and Cebu Case Studies* by Guillermo Tabios III, UP Diliman, and Cristina C. David, PIDS (with discussion from Lope Villenas, National Water Resources Board and Alicia Bongco, Laguna Lake Development Authority)

- *A Model of Water Resource Governance in the Philippines* by Ben Malayang III, UPLB (with discussion from Mai A. Flor, Business Development- Philippines)

- *Legislative/Policy Implications for Water Resource Management* by Antonio Contreras, De La Salle University-Manila (with dis-

cussion from Nereus Acosta, representative, 1st District of Bukidnon)

Comments of Mr. Vic Abrogueña on the paper of Dr. Agnes Rola on *Economic Development and Use of Water Resources*

The study is very relevant.

- The empirical data it presented are common in local ecosystems in Bukidnon.
    - o Deforestation led to cleared lands for agricultural cultivations and development.
    - o Deforestation led to loss of ecological services of the forest ecosystem.
        - The loss of the forest ecosystem led to wholesale extinction of the flora and fauna.
    - o Deforestation led to the process of sedimentation not only in upland water/river channels but all the way to the coastal areas, further compounded by aquifer depletion and topsoil loss.
    - o Agricultural development greatly influenced the trends of water quality and quantity.

- The empirical data presented by the study portrayed how economic development impacts on the ecosystem. It also appreciates local approaches in the context of administrative and policy settings on top of regulatory interventions by government bureaus and offices.

- The study offers relevant insights toward sustainable water resources management.
    - o Fiscal sustainability
    - o Consistency between economic policies and environmental policies, and the need for an effective management plan to operationalize these consistencies
    - o The local communities which are considered frontline losers from natural resource degradation must be capacitated and empowered

- Strengthened roles of local government units (LGUs) on environmental protection

How does the study concretely appeal to nongovernment sectors and their environmental sensibilities?

- It opened a certain direction that will positively combine the sensibility of conservation and economic development in Bukidnon.
  - This positive combination comes in the form of trade-off system.

Advocacy for trade-off system

- It is spearheaded by the Bukidnon Resource Center (BRC), a nongovernment group established in 1997.

- BRC is committed to the concept of sustainable development with strong bias toward biodiversity conservation, people empowerment and participation in governance.

- This group acts as a co-convenor of civil society congress in Bukidnon; also chairs the collegial forum of Bukidnon NGOs and POs; and presides over PHILCOS-Bukidnon (Philippine Community Organizers Society-Bukidnon Chapter).

Facts and lessons in Bukidnon

- Bukidnon's ecosystem is primarily forest-based, being a landlocked and terrestrial area. The empirical data that were presented in the study were all true in Bukidnon, precisely because the setting of the study was the town of Lantapan, located at the foot of Mt. Kitanglad, a protected area.

- According to the publication by the Institute of Environmental Science for Social Change entitled "The Decline of the Philippine Forest," Bukidnon was open to commercial logging in the 1920s until 1990 when Secretary Fulgencio Factoran issued a memorandum order that imposed a logging moratorium in Bukidnon.
  - The imposition of a logging moratorium was not without a price, to name a few: the death of Fr. Neri Safur who bravely

stopped timber poaching in his parish; endless barricades by the church and nongovernment sectors; and hunger strikes that were undertaken in Bukidnon and in Manila in front of the DENR office.

- Ironically, deforestation was argued in the context of economic development. Trees should be cut and logged to bring about employment in the countryside to construct schools and day-care centers, to have steady supply of cereals and food to the tables of upland families. In short, the trade-off system was already practiced before. But the focus was not on the concept of sustainability of resource but a wholesale destruction of the forest ecosystem.

- The advocacy for a healthy trade-off system, which the Bukidnon Resource Center is currently and aggressively pursuing in coordination with other nongovernment groups, is the conservation of the forest ecosystem and restoration of the same in other deforested areas, in order to promote sustainability of water resources. Water can never be considered a resource to economic development if there is no forest ecosystem to sustain it.

- Ecosystems, be they forest-based, marine, and land-based, are resource producing. We could allow, in our advocacy, our natural resources as propellers to economic development, on condition that our ecosystems be conserved.

- To put this system in place, this requires positive coordination in the playing field with key players—economic and corporate planners, the government sector, the nongovernment sector and the academe, the church and other stakeholders.

Partnership with the study team

- While the advocacy for the trade-off system is not new, its institutionalization as an effective intervention mechanism with multisectoral stakeholders is quite an encouraging advocacy.

- This is where partnership with the study team is a welcome proposition. Perfecting this system requires collaborative research and

studies to determine local ecosystems in question and other socio-economic conditionalities. Other interests will certainly intervene in the final formulation of the system.

Comments of Dr. Rex Cruz on the paper of Dr. Herminia Francisco on *Watershed-Based Water Management Strategy: The Missing Link to Sustainable Water Services*

The watershed approach

- It is defined as the application of watershed management principles to the management of a natural resource such as water or to the management of an area and all the resources therein. The principles may vary from place to place but in the Philippines, the principles of watershed management are specified in the Philippine Strategy for Improved Watershed Management. These include:
  - o Integration. This implies internal integration in the watershed, integration across watersheds, integration across institutions and agencies and integration of policies.
  - o Multiple use. The use of water, land and other watershed resources for several purposes in a manner that will provide the greatest benefits for the greatest number of people for the longest time possible.
  - o Participation. Active involvement of stakeholders in planning and implementation.
  - o Multisectoral and interdisciplinary. Participation of key sectors and disciplines in management. In a way, also integration across sectors and disciplines.

Adequate and balanced supply and demand-side solution is the cure for water resources problems.

- The problem is not that there is imbalance in the supply and demand side solutions but that the solutions on both sides have been inadequate and disarrayed. There have been a lot of confusion in the way watersheds should be managed in the same way that there have been confusions on how the water resources should be administered and utilized.

Watershed-based water resources management, the way to go

- Success in water resources management hinges largely on the fair appreciation of the behavior and properties of water and the processes associated with it. The behavior and properties of water and hydrologic processes are a product of the sum total of the direct and indirect influences of biophysical and socioeconomic factors and forces within the limits of the watersheds. Water moves about the confines of a watershed and is also influenced by factors from outside the boundary of a watershed. The best way to precisely understand how water is affected by the manner we use it and other natural resources associated with it is to look at water resources within each watershed as distinct from water resources in other watersheds. Hence, managing water resources on a watershed basis is the way to go.

Implications of watershed-based water resources management

- Primary focus of management will be on water but attainment of objectives related to water will have to be weighed alongside objectives related to the environment and other socioeconomic concerns.

- Reforms on the system of preparing land use and management plans for natural resources and even of political units will have to be made. This will entail a shift to the use of watershed as the planning management unit. Management and development options will need to be evaluated on the basis of their sustainability vis-à-vis the sustainability of water and other watershed resources.

- The sustainability of water and watershed resources will have to become a common objective among the various government agencies.

- Political, institutional and sectoral boundaries will have to be crossed if not obliterated in order to promote greater and lasting collaboration between and among LGUs, institutions, agencies and sectors that often have competing and conflicting interests in the watershed. The challenge will be on how to develop arrange-

ments where the sharing of benefits and responsibilities is acceptable to all parties.

- As mentioned in the paper, there is a dire need for comprehensive watershed information base.

Comments of Dr. Florentino Tesoro on the paper of Director Romeo Acosta on *Assessment of the Watershed Approach in Natural Resource Management in the Philippines*

- A well-managed watershed and a change in the attitude among downstream users toward water wherein it is recognized as a commodity that must be paid for, contributes significantly to sustainable water supply management.

- The paper made a comprehensive assessment of policies and implementation of watershed management in the country.

- In addition to what have been mentioned in the paper, there are also several other projects undertaken by agencies both at the local government and community level as well as by DENR in the management of watershed resources
  - o LGUs' efforts in watershed management.
    - The Maasin watershed experience is an excellent piece of LGU-community-government-private sector collaboration in watershed management. It was an initiative of the provincial government of Iloilo in support of the community that primed the rehabilitation efforts for the Maasin watershed; contributions from various sources came which the LGUs harnessed and unified for the rehabilitation of the watershed.
    - Another collaboration between the LGU and the community that is worth mentioning is the Barobog watershed in Bayombong. It is a small watershed situated in Bayombong, Nueva Vizcaya. What is interesting here is that there was no outside assistance given except from the LGU and DENR. Barobog is a small watershed consisting of only 439 hectares and yet this supplies the domestic water needs of about

2,000 households in Bayombong and Solano, two fast urbanizing towns. It also provides irrigation water to about 400 hectares of agricultural lands. The watershed is home to 134 households. Before the efforts to organize the farmers began, the watershed was suffering from the usual degradation of forest, proliferation of grass and open lands and heavy soil erosion. The water users downstream were also suffering from a poor quality supply of water. Past provincial governments tried to eject the farmers yet the degradation continued. In 1992, the DENR devolved to the provincial government of Nueva Vizcaya the management of the Barobog watershed. The provincial government, through its environment and natural resources office, forged an agreement with the farmers to organize themselves into the Barobog Watershed Occupants Association. The farmers were given tenure of the land and provided technical assistance by a team consisting of a forester, an agriculturist, a veterinarian and a cooperative agent. The provincial government provided seedlings to the farmers in addition to improving roads leading to the community. The DENR processed the documents giving farmers tenure to the land. After 4 years, the watershed has become fully forested except for patches of areas planted to agricultural crops. Burning is no longer practiced. The communities are vigilant in ensuring that there are no new migrants in the area.

- The above examples of watershed management by local government units strongly support the contention that forest resources can be better managed by LGUs given certain conditions such as ample resources, commitment and experience of the LGUs. The DENR has under its jurisdiction such a large tract of land and has very small personnel and very limited resources that it cannot effectively manage these areas.

o Most of DENR's programs suffer from inadequate resources, very few personnel and limited funds, particularly for monitoring and evaluating projects.

o On watersheds being managed by other agencies, Director

Acosta's paper spoke of the truth. Unfortunately, DENR retains control over a number of things in the watersheds such as the harvest and transport of forest products. What DENR should do is to assist managers prepare management plans and for DENR to monitor and evaluate those management plans and make sure that these are fully implemented.

- The devolution of small watersheds is allowed in the Local Government Code. However, no definition has been made yet on what constitutes a small watershed. And until such is done, it would be difficult to implement that provision in the Local Government Code.
- Sustainable resource management has been practiced for the past 40 years and yet it appears that there has been little progress in the direction of sustainable management of our forest resources. Maybe the reason for this is that, the overall policies in watershed management are not compatible with local conditions.
- The paper of Dr. Francisco, meanwhile, delves comprehensively with the macro management of watersheds. This is very important in the overall management of resources especially through management councils. Equally important is the on-the-ground management of the watershed which is often determined by policies of government.
- The idea that logging is illegal to start with, and that farmers have the burden to prove that they are not doing so is not encouraging to farmers to continue to plant trees. The common reason given for this regulation is that the logs may have come from government plantations. The burden of protecting government plantations rests on the government and if the government is not capable of protecting its plantations, it should not shift the burden to the farmers of proving that the logs they are transporting are their own. It is presuming that the farmers are guilty of being illegal loggers unless proven otherwise.
- What the government can do is use slow-growing species of trees in its plantations. After all, the areas being reforested by the government are supposed to be protected areas, not the production areas. That way, all logs of fast-growing species

found on the road may be assumed to have come from private plantations. If the farmer or plantation developers insist in planting endemic species, they should be advised that when they harvest those logs, they will be subjected to certain regulations. In short, we should deregulate the planting, harvesting, transport and marketing of plantation grown species.

- Dr. Francisco relates that in Colombia, a certain percentage of revenues from hydroelectric generation are devoted to watershed management. This scheme was also adopted in Costa Rica. In the Philippines, a similar scheme, R.A. 7638, which created the Department of Energy (DOE) in 1994, also provided that the DOE shall devise ways and means of giving direct benefits to the province, city or municipality, especially the community and the people affected. Preferential benefits should also be given to the regions where the energy was sourced out.
  - o Pursuant to this Act, the DOE prepared a set of implementing rules called Energy Regulations 1-94. The National Power Corporation is supposed to levy 25 percent of one centavo per kilowatt-hour for official resettlement and relocation of communities affected by the power generation plant and for establishing relevant training and skills development programs for reforestation. Twenty five percent of 1 centavo per kilowatt-hour of total sales is supposed to establish and maintain a development livelihood fund. One-half of 1 centavo per kwh of total sales should be used for reforestation, watershed management, health or environmental enhancement. The RA was amended in 2000 by RA 9136 otherwise known as the Electric Power Industry Reform Act. Section 34 of this amendment states that an environmental charge equivalent to ¼ of 1 centavo per kwh shall be collected and this shall accrue as an environmental fund to be used solely for watershed rehabilitation and management. Said fund shall be managed by the National Power Corporation.

- On the sustainable forest management bill. The sustainable forest management bill now in congress, if passed, will provide a stable

environment policy for sustainable management of forest resources particularly the watersheds. The bill, if enacted, will actually place watersheds under sustainable development units. Director Acosta has given in his paper an outline for implementing the watershed as a planning and management unit.

OPEN FORUM

On environmental laws and their implementation

- The government is not doing its function of monitoring and properly getting the so-called environmental charge or fees from the industries in the urban areas that violate environmental laws. There is no money in the upland area and there is no industry there that is willing to pay except may be the big firms and the PNOC. PNOC in Mt. Apo, for example, gave P1 million to a barangay there which was displaced from the site. But they immediately got P800,000 back because they are supposed to be subsidizing the village. Then they gave P200,000 for livelihood projects. However, the one doing the livelihood projects is PNOC itself and PNOC even got further funding from a GF-funded project of DENR and Earthsavers. These scenarios show that there is also a problem with the actual implementation of "nice laws" such as the Energy Act and the ½ of 1 centavo per kwh going to local development.

- The Congress, with Representative Nereus Acosta and Secretary Alvarez when he was still a congressman and then senator, has been pushing for the Clean Water Act. However, unless a consensus from the academe and the NGOs who have no vested interest is shaped, problems are likely to arise from possible policy shifts in the water issue.

- There is a need to talk more seriously about balancing the socioeconomic needs of the poor people in the uplands and the practices of the industries in the urban areas. There are a lot of issues that have to be raised. A lot of agencies also have to be encouraged to have more data. But to gather data, there is a need for funds to support this.

- Water use is being shifted from the uplands to the urbanized areas but nobody is paying upland communities their share of the income generated by urban industries. There are a lot of inequities as well as bad implementation of the existing laws and the policies that are being promulgated by both the executive branch and the Congress.

Response of Dr. Francisco

- Water resource management covers not only upland farming but also industries located within the area that may also be contributing to water pollution. So the watershed approach in this case is not limited to forestland. As a tool in water resource management, it will be able to identify who the providers of services are and if the upland farmers are indeed engaged in protecting the watershed. If the industries are contributing to pollution, then in like manner, they should be made to pay for this resource degradation.

On Dr. Rola's study

- Was there a comparison of total suspended solids present in affected and unaffected watersheds?

- Dr. Rola's study relied on people's perception on looking at the pollution of water quality in watersheds.

- Is it possible to pursue economic development without negatively affecting the water sources? Having data on how much water is available for development will serve as a guide for LGUs.

- Dr. Rola concluded that agribusiness was a major culprit in the water misuse in Bukidnon. However, she did not show any data on how much water is actually devoted to agribusiness relative to residential or commercial use in Bukidnon.

- It is dangerous to conclude and cite water pollution on the basis of perception. This conclusion must be backed up by chemical parameters.

Dr. Rola's response:

- On the first issue: what was studied in Bukidnon were four subwatersheds representing a spectrum of situation in areas with varying demographic characteristics, forest cover and agricultural intensification. There was no watershed that did not have people in it.

- On the second issue: The team was not able to have chemists who could have monitored the chemical residues. So the team relied on the perceptions of the community members who have been using the water for their basic needs such as drinking and washing. And the perception was that there was a change, i.e., in the taste of water from the early 1990s to the present.

- On the third issue: Information about water supply will be very ideal. Municipal planning officers in the different towns in Bukidnon want to have this particular information.

- It was not explicitly stated that agribusiness firms contributed largely in water misuse.

- The team has some preliminary data on the chemical composition of pollutants but they are not yet included in the paper.

Dr. Tesoro's response

- Siltation is not just because of human activities in the upland. The Magat dam increased in siltation after the 1990 earthquake because of slides. Example is the earthquake in 1990 when most of the soil eroded into the Magat dam, increasing the siltation by about 20 times.

On the question on whether money can be made from water?

- Is it possible for the local government and the local communities to make money out of their water from their backyard by producing bottled water? Since 1994, we have been importing mineral water. In 1994, we imported US$8 million worth of mineral wa-

ter. In 1996, we imported US$12 million worth of mineral water. So there is money in water.

- Water is a property of the state. But the Local Government Code stipulates that 40 percent of the resources within the territorial area of the different LGUs can be utilized. But who shall make money out of water? The government has authorized LGUs to tax water districts. The water districts, in turn, may tax the industries because there is an opportunity cost there. As the water is being utilized as long as you are above the threshold value of the recharge, then no harm is done. But as soon as the water level starts dropping and the recharges are being utilized more and more, then the opportunity cost for the government is being lost and it is only but fair that somebody has to pay, including the industry or any entity which is using water commercially.

- However, with regards to water districts, it will be very difficult to run after them since water districts are semigovernment institutions created by LGUs or by decree of the mayor. It represents the community and it provides water to the community. Therefore, the water districts should monitor other users of the water. So money can be made out of water. But there needs to be a will to push for it.

Dr. Francisco's response

- The Local Government Code is clear on this issue. It allows the LGUs to collect a share in the use of natural resources within their areas of responsibility. In the Maasin watershed, they have used this provision to be able to collect 1 percent of the total revenue of the water districts. What is really needed is to assist LGUs for them to be able to tap that provision; for them to know that they can actually do that. It will be better if the LGUs themselves will invest on the firm. But the problem of LGUs in this kind of arrangement is more on the financial side such as capital rather than policy-related.

On DAO 24

- Policymakers should be careful in making more policies because there are already lots of policies in place. The DAO 24, for instance, which is part of the Master Forestry Plan of 1991, says that there is a total commercial ban on logging in virgin forests. The conditions are that in areas above 1,000 meters elevation, there is total log ban. But what do we have above 1,000 meters elevation? In actuality, there is total log ban in areas where you have no logs. And all lowland forests are left open for logging. Meanwhile, the reforestation efforts of the government have not been very effective. From the beginning, they have been planting fast-growing species. Simple logic dictates that if one cuts a kind of forest, he would like to bring back the forest that he cut. However, it is obvious that the intention now is not really to reforest but to simply plant trees.

Undersecretary Tesoro

- DAO 24 prohibits or bans the cutting of trees from 1,000 meters above sea level and also on slopes greater than 50 percent. The main reason for the 1,000-meter elevation requirement is because in those areas, the trees are no longer commercial because they belong to the mossy forest type. And this is the type of forest that needs to be conserved for biodiversity purposes. Meanwhile, the 50 percent slope is because it was pointed out that the erosion rate at 50 percent is quite high. With respect to the planting of fast-growing species, the objective really is to increase the volume harvestable in the next cycle.

Director Acosta

- The 1,000-elevation threshold is separate from the old growth. The DAO 24 policy says that there will be no logging above a 1,000-meter elevation, 50 percent slopes and old growth forest, which are below the 1,000-meter elevation.

- On planting exotic and fast-growing species, if the objective is to produce wood, then one should go for fast-growing high-yield

species and a lot of these are exotics. But, if the objective is to revegetate or put back the vegetative cover, then two things can be done. The more publicly visible way is to start planting, including exotics. One can also do it in a slower way. Just protect that area so it is not burned and let the next generation of species come out. However, this is going to be very slow but you get the natural forest structure.

- There should be a clear idea or agreement on what we are to use our forests for. Are we to use our forests for production of timber? Or for production of biodiversity? Or for production of water? Are we to look at forests as something that must always be for the service of human communities? Or must human communities also have a service to forests?

On the availability of data/information about water resources.

- The problem is exactly on the lack of available data on water resources. As an example, since the 1970s, there have been 500 monitoring stations for the various hydrologic parameters such as the high flows and the low flows. From the 1980s, the number declined to 100 monitoring stations. So, how can we quantify the amount of water available and then try to find out how we are going to utilize it and how much money we need to do that? Unless we improve the data collection, we will not be able to make the rational conclusions based on the amount of water that is available.

- Therefore, data gathering and monitoring have to be done. In the central government level, we have not gone very far. Therefore, there is really a need to address this by devolving the process down, even to the municipality level because they are the ones who have the interest to monitor the water situation in their own areas.

On watershed rehabilitation

Mr. Abrogueña

- If we make the watershed as a basic planning unit for resource management, we should first define what kind of rehabilitation we will need to undertake for our watershed.

Comments of Dr. Lope Villenas on the paper of Dr. Guillermo Tabios III on *Competing Uses of Water in the Philippines, with Laguna Lake, Angat, Batangas and Cebu Case Studies*

Issues/concerns raised in the paper

- Safe groundwater withdrawal
  - o How much groundwater pumping should be allowed without causing problems such as depleting the groundwater resource or land subsidence?

- Competing groundwater uses/users
  - o There are competing users of water from the same groundwater aquifer such that deep well overpumping may lead to salt water intrusion and possibly lowering of the groundwater piezometric levels.

- Groundwater use regulation issue
  - o The deputation of the MCWD to regulate and control groundwater usage to safe yields has not been satisfactory due to lack of groundwater monitoring facilities.

- Management issue
  - o Largescale, complex systems like the Laguna Lake need real time water quantity and quality data monitoring system and computer models with combined simulation-optimization techniques for planning, management and real-time lake operations. These are needed for optimum management of hydrologic/hydraulic dynamics and water resource operations.

- Irrigation water versus domestic water supply releases
  - Ever increasing demand for domestic water supply could be met at the expense of irrigation water allocation.

Policies on competing water use

- The Water Code of the Philippines (PD 1067) is the basic water law of the Philippines anchored on the principle that all waters belong to the State and as such, these waters are not subject to acquisitive prescription. The use or development of water is allowed only by administrative concession through the issuance of a water permit from the NWRB. It is supported by a compendium of rules and regulations for effective enforcement of its provisions. Among the provisions that pertain to competing uses of water are the following:
  - Article 22: Between two or more appropriators of water from the same source of supply, priority in time of appropriation shall have the better right, except that in times of emergency, the use of water for domestic and municipal purposes shall have a better right over all other uses.
  - Article 95: When priority in time of appropriation from a certain source of supply cannot be determined, the order of preference in the use of waters shall be as follows:
    - domestic and municipal use
    - irrigation
    - power generation
    - fisheries
    - livestock raising
    - industrial use
    - other uses
  - Article 23: Priorities may be altered on grounds of greater beneficial use, multipurpose use, and other similar grounds after due notice and hearing, subject to payment of compensation in proper cases.
  - Article 27: Water users shall bear the diminution of any water supply due to natural causes or *force majeure*.

- Article 19: Water rights may be leased or transferred in whole or in part to another person with prior approval of the Council, after due notice and hearing.

Related activities

- Groundwater studies
- Resistivity report
- Rapid assessment on water supply sources in the Philippines
- Master plan study on water resource management in the Philippines
- Groundwater models
- Groundwater evaluation model
- INTERF Programs
- AusAID-assisted project on "Strengthening Management of Groundwater Resources with LGUs"

Comments of Mrs. Alicia Bongco on the paper of Dr. Guillermo Tabios III on *Competing Uses of Water in the Philippines, with Laguna Lake, Angat, Batangas and Cebu Case Studies*

Competing water uses in Laguna de Bay

- Flood control
  - Laguna de Bay acts not only as the buffer for the natural attenuation of flood peaks generated in the tributary catchment areas, it also interacts with the Marikina/Pasig River system.
  - The Manggahan floodway was constructed as a high capacity shortcut between the Marikina River and Laguna de Bay.
  - Model calculations under the SDLBE project show a minor effect of the proposed dike on the water level of the lake particularly in periods of rainy season.

- Fish production increases in years with saltwater intrusion. The increased food concentration in the water will increase the fish production for species like Milkfish, Tilapia and Big Head.
  - The Laguna Lake Development Authority proposes a Polder Island Development Plan through an innovative technology aiming to present a vision for sustainable development.

- A water reservoir is proposed to be built between elevated dikes. Fresh water will be stored during times that salinity levels are low.

- Pollution control
  - The sources of pollution in the lake are from industrial discharge, agricultural run-off and domestic wastes.
  - The LLDA conducts monthly sampling of Laguna Lake water and surrounding tributaries to monitor the degree of pollution in the lake.
  - The Integrated Water Resource Management division of the LLDA is using Waste Load Model and Delft 3D hydrodynamic and Water Quality Models under the SDLBE project to simulate the actual and future discharges of waste loads to the lake.

- Optimal lake use zoning
  - The basis for determining the allowable area for aquaculture, which is synonymously considered by the LLDA as the lake's carrying capacity was the computational procedure developed by Centeno et al., in 1987.

- Navigation and safety requirements
  - One of the uses of Laguna Lake is for navigational purposes to transport goods and services from one place to another within the lake.
  - With regards to the dredging of Pasig River, the DPWH conducts such activity to uphold sanitation of the said river by removing and properly disposing spoils. This is to mitigate flood damages by increased flow capacity and improved navigability of the lower Pasig River.

- River diversions
  - To solve the flooding crises in Metro Manila, the DPWH and PMO established the Effective Flood Control Operation System.

- The stretch of the Pasig-Marikina River is Metro Manila's main drainage system.
- Current practice tends to allow salinity intrusion to take place in favor of the fishery sector, but to the detriment of consumptive water use and several other uses.

- Safe groundwater withdrawal
  - According to the Groundwater Availability Map of the Philippines (1997), and other related maps of Groundwater Regions in the Philippines (1999), western, southern and eastern lake borders are fairly extensive and productive aquifers and the northern lake border is local and a less productive aquifer.
  - The continuous groundwater mining in Metro Manila has resulted in steadily expanding groundwater level depressions to depths considerably below sea level.
  - An extensive research study needs to be conducted to establish a link between groundwater and surface resources in the Laguna Lake and the effect of too much groundwater abstraction on the lake border area.

Comments of Atty. Mai Flor on the paper of Dr. Ben Malayang III on *A Model of Water Resource Governance in the Philippines*

General impressions on the paper

- Dr. Malayang's paper addresses the paucity of governance as far as water is concerned.

- The paper is very timely as water has become a very critical issue these days and is receiving, as is deserved, more attention than ever. Specifically, the governance of water has become a key element in addressing the various issues confronting water resources management today.
  - At the 2nd World Water Forum held in The Hague in March 2000, the Global Water Partnership Framework for Action stated that "the water crisis is often a crisis of governance."
  - The World Commission for Water in the 21st Century concluded that although water management is clearly everyone's

responsibility, the role of governments is crucial in providing an enabling environment that will empower the various sectors into action.
  - In the Bonn 2001 Freshwater Conference held last November, the Ministers recommended action in three areas, with water governance as the most important.

- Dr. Malayang's paper will be an important contribution to the Governance Dialogues organized by the Philippine Water Partnership, in preparation for the Kyoto Forum on Water which will be held in 2003.

Points of reaction

- General concerns
  - Although the model was first developed with forest resources management, it is indeed applicable to water since water itself is a resource, a fact that seems to be ignored by our own institutional set-up in government.
  - Although the model is constructed based on the Philippines' experience, it may easily be applied to most countries as indeed the issues concerning water governance is not unique to the Philippines.
  - The model, as proposed, should be looked at in the light of the new policy consensus that combines the principles formulated in Dublin and Rio. The Dublin Statement on Water and Environment calls for the following: a holistic approach; participatory, decentralized approach; as an economic good; and efficient and equitable allocation.

- Specific concerns
  - The water situation in the Philippines is one of "abundant scarcity." It is truly a case of "water, water everywhere but not a drop to drink."
  - Dr. Malayang's model is actually simple. It basically presents what Dr. Malayang calls a "governance space" which is the intersection of three axes.
  - What does the model mean? Simply, the multiplicity of insti-

tutions, the hierarchy of their authority and jurisdiction, the mandates of institutions and sectoral representations make for the very complex nature of water resources management.

- Given today's multiplicity of institutions, water policy is shaped by who is most powerful. In most cases, especially where water use has a significant local interest, local governments are quite powerful.
- Water policy in the Philippines today is a result of who has the power to influence water policy. Power emanates from, at least, not only the support from the highest authorities or what Dr. Malayang calls legitimacy but more importantly, from the money it has—who got the money to implement all this? And who is not beholden to anyone?
- The paper did not extensively discuss institutional capacity which is at the heart of water governance. Present situations indicate that several agencies vested with water-related mandates have no capacity in the first place to handle such mandate which then affect the effectiveness of the institution in the delivery of services expected from it.
- Adaptive collaboration as mentioned by Dr. Malayang may be a potent mechanism for shaping water policy and management. Integrated water resource management (IWRM) is a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.
- The Philippines has a system in place albeit not functioning as effectively. Under the Water Code, the NWRB is empowered to perform all these but given the limited resources it has been allocated, the task obviously does not match the resources it has been given.
- River basin authorities will also be created in the critical areas. A system for economic pricing is being studied. This will make it easier to allocate and reallocate water supply in times of drought.

- The time is critical—business as usual will not work. Radical changes have to be made and we all should play a part to ensure that this limited and most precious resource is sustained for the use of future generations.

Comments of Cong. Nereus Acosta on the paper of Dr. Antonio Contreras on *Legislative/Policy Implications for Water Resource Management*

Why don't we have this kind of fora in Congress? Otherwise, this becomes rather academic and we are talking to ourselves and preaching to the choir. The truth of the matter is, we all know the problems. We all recognize that water resource management problems are directly correlated with the crisis on governance. A crisis on how power is distributed, exercised, utilized, abused, misused and how they actually impact on all the mechanisms for the supposed proper implementation of such laws governing water resource management.

These are very real critical policy dimensions that must be addressed in Congress and must be grappled with great earnestness. A forum like this is most critical in Congress. Unfortunately, this does not seem to have much of a resonance in Congress, which is really where it should matter.

I agree with all of what Dr. Contreras said. The tensions between institutional capacity and institutional economy. The tensions and the balance needed between regulation and command-control approaches on one hand and the need for stringent advocacy measures on the other. Meaning the need to really get the word out and get the capacity-building process in motion.

I like what he says about the need for activism, on one hand, but restraint, on the other. But I will be the first one to tell Dr. Contreras that there is no such thing as restraint in politics.

Power refers to simply the whole process of who gets to say what, when and how. And the budget is the most intensely political process you

could possibly witness. Who gets to do, who gets to say and who gets to get what, when and how. And water resource management is only one of those arenas where this manifests most intensely and the crisis truly looms not just in the far horizon but just before our very eyes.

I do agree that the challenge has to do with understanding the complexity of what lies before us and in front of us. As Aristotle said, "A problem well examined and analyzed is already half of the solution." Unfortunately again, we have not gone far in the analysis and examination of our policy problems in Congress. And so, even with the Clean Water Act, coming from the experience of the Clean Air Act, we will push as best as we could because that is what we are called to do. Somehow, we will be able to achieve the balance between restraint and activism; capacity in one hand versus economy on the other; regulatory, command-control versus market-based; the interfaces between governance and science. We must be able to grapple all of these at least in the advocacy stage because that is what needs to be said. And that is what needs to be conveyed.

We should always begin with advocacy because that is where a reform agenda gets set. And then you move forward in a linear fashion to the second A, which is the articulation. This means articulation not only in the debates or the discourse that would emanate in Congress but in the actual drafting of a bill or policy initiative. Then it moves on linearly towards the third A, which is the application. The problem that I see is that we do have some advocacy but it is not critically harnessed enough. And our application? Yes we do implement some laws, in fact lots of laws. But the application of such are not streamlined or rational. There is no sense of how to administer such in this application/execution stage.

These are therefore the challenges that we should look at. However, this should not stop as a challenge to all of us. It should not stop at fora like this. Because these kinds of fora should be conducted where they should really matter—the House of Representatives. This should be our call.

Open forum

Laguna Lake as a source for drinking water

- Assuming that this is going to happen, what will happen to the ecology of the lake? Fishery production will be reduced significantly. In addition, farmers are complaining that the lakeshore, which is used for production such as planting of corn and other crops, has been submerged significantly during the past two years. It seems that LLDA had not been forthright and just raised the level of water without properly informing the people.

- Will LLDA inform the users of the Lake regarding the true status of the quality of water in the Lake? LLDA has been the only agency which is studying the Lake. Scientists from other institutions are no longer given funds to study the Lake.

Mrs. Bongco's response

- LLDA's policy is not limited to water supply. Instead, it is a multi-use policy that also takes into consideration the fishermen. With regards to consultations, LLDA has met with LGUs, NGOs, fishermen, farmers and the business sector. LLDA presented this capacity-building case to these people and solicited feedback from them. This consultation process is a continuing process. However, LLDA has yet to consult with the scientists' group.

On the need for legislative intervention

- Ayala Water Company has been using Laguna Lake as a source of water supply. And no EIS or ECC was given to this company by the DENR. This is therefore a classic example of a case where legislative intervention is not required. While the law is there, it is in the hands of the citizens, the NGOs or the academe to stop or correct the situation.

On the paper of Dr. Contreras

- There is restraint in the localization of the mandate on water sector.

- PD 118 has created hundreds of water authorities in the form of water districts. This is against the concept of having a cohesive and effective local governance.

Dr. Contreras' response

- The spirit of devolution, in which DENR is one of the major players in community forestry, allows for devolving some of the functions to local bodies. Thus, there is no reason why one should consider it a problem if there will be regional authorities for water. The problem in water governance in the Philippines is complex considering that it is an archipelago with varying geophysical configurations. Why should we shift back to centralizing the administration of water when the mode of governance right now is more decentralized?

Dr. Malayang's response

- The model presented in the paper suggests that it is not ideal to put all the decisionmaking to local institutions. However, it would be bad if all the decisionmaking is left to some national institutions alone. The idea is to keep the right balance between local decisionmaking and national decisionmaking. It is also best to recognize that decisions and actions on water must be landscape-wide rather than isolated. The issue is not whether we have enough laws or whether we need more laws. Rather, the issue is to look at the laws and see what guidelines they offer with respect to different water institutions.

On devolution of powers

- Management of water resources should be devolved to local government, at least to the provincial level. Local authorities should be the ones to analyze the problems of their communities and find solution to these problems. However, a governing body on the national level such as the NWRB that would adjudicate in the dispute situations is also necessary.

Dr. Malayang's response

- It is a mathematical imperative to devolve because the range of ecological, social and cultural conditions in the Philippines is very wide. Cordillera would be totally different from Basilan, culturewise. Therefore, implementing a single and uniform policy for the entire country on the basis of estimated average condition is mathematically wrong. The way to go is to differentiate based on the ecological and other conditions of every region in the country.

On Congressman Acosta's suggestion to bring the Policy Forum on Water Resource Management to Congress

- Dr. Lamberte informed the participants that PIDS has been conducting a joint discussion program with the Congressional Planning and Budget Office (CPBO) and the Speaker's Office. In the past Congress, the PIDS has held a forum discussion every other month and the topic was jointly defined with the CPBO and the Office of the Speaker, depending on the legislative priorities. What PIDS did was to bring some scholars to Congress to talk to lawmakers directly. Dr. Lamberte also informed the group about the online initiative of the PIDS with the CPBO called the Economic Resource Base for Legislators (ERBL). The website consists of policy studies that would aid in the policymaking process. This forum on water will definitely be a good topic to include in this series.

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There is a water crisis, which is aggravated by a flawed governance of water resources. There is a need to empower local government units and communities to address the water crisis.

This book presents a holistic analysis of the water situation that focuses on supply and demand conditions as well as on the social, economic, legal and institutional context of the problem. It argues for watersheds as the appropriate planning unit for an integrated water resources management system. It recommends pluralism in the modes in water governance in the country that will enable local stakeholders (LGUs, civil society) to evolve appropriate mechanisms in accordance with local social, political, economic and ecological realities.

In sum, the book seeks innovative ways of trying to win the "water war" or of dealing with water scarcity and its related concerns.

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