MARKET-BASED INSTRUMENTS FOR WATER RESOURCE CONSERVATION IN MT. MAKILING, PHILIPPINES: A Case Study*

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ABSTRACT

The Makiling Forest Reserve (MFR) is an experimental and educational forest reservation 65 km south of Manila. The development of economic instruments for more reasonable water pricing was initiated primarily to promote conservation of the water and other resources from MFR. Specifically, the project was designed to increase efficiency in MFR resource utilization by elevating the level of awareness and sense of responsibility of the water users to protect the resources of the watershed from where their water comes from. The study was also designed to develop sustainable sources of funds for the development and protection of MFR watersheds. The economic instrument was initially based on the willingness of users to pay using the contingent valuation technique.

An additional amount that the users are willing to pay on top of the current fees they are charged for using water was generated through the analysis of the preliminary information collected in the study. About 67% of the domestic water users agreed to pay an additional amount ranging from $0.03 to $0.04 per cubic meter of water they use. Assuming that a minimum of $0.02 is added to the current charges per cubic meter of domestic water consumed, sufficient money can be generated and used to implement various management activities to protect the watersheds within the MFR. Modes of payment, fund management and other aspects of implementation are also discussed in this paper.

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INTRODUCTION

Watershed refers to any topographically delineated area that can collect water and drained by a river system with an outlet (Brooks, et al., 1991 as cited by Cruz, 1997). It includes all land areas extending from the ridge down to the stream for which water is collected. Watershed management is defined as the process of guiding and organizing land and other resource uses in a watershed to provide desired goods and services without adversely affecting soil and water resources (Brooks, et al., 1991 as cited by Cruz, 1997).

Most watersheds in the Philippines invariably suffer from resource degradation oftenly associated with increasing population, pervasive poverty and urbanization along with inefficient resource utilization and scarcity of funds for carrying out watershed development and protection programs. The development of economic instruments for the use of water and other watershed resources is expected to open new possibilities for promoting a more efficient resource use and raising adequate amount of money that can sustain watershed management activities.

The current schedule of fees that users of water emanating from the Makiling Forest Reserve (MFR) are paying is adequate only to cover the cost of bringing the water to the tap. Like in other parts of the country, the fees for water use do not include the cost of actually protecting and managing the source watersheds, cost of environmental damages that go with the use of water and the cost of forgone opportunities. Consequently, the value of water in the country is in general underestimated. The under-valuations of water virtually make water a free commodity and hardly discourages the wasteful use of water. Consequently, water resources in many parts of the country deteriorate rapidly and is aggravated by the insufficiency of funds to rehabilitate and protect water and the watersheds.

This study attempted to look into the patterns of water consumption within and around the watersheds of MFR, the allocation and use of collected fees and charges from water users, and the viability of generating funds for the protection and management of MFR watersheds via an improved system of pricing water.

The general objective of this study is to develop an appropriate market-based instrument for pricing water resources. Its specific objectives are: (1) to identify the different types of water users, their consumption rates and existing fees and charges collected from them; (2) to determine how much the household water users are willing to pay to rehabilitate, protect and manage the watershed resources where this water is sourced; (3) to assess how said fees can be collected, managed, and used for the MFR; (4) to design and pilot test the implementation of the economic instrument to collect

watershed fee from various groups of water users; and (5) to draw policy recommendations relevant to the use of MBIs for water resources conservation.

REVIEW OF LITERATURE

Water Resource Valuation

Pearce and Turner (1990) explain that the contingent valuation method (CVM) is one of the direct approaches to the economic measurement of environmental benefits. The approach basically asks people what they are willing to pay for a benefit and/or what they are willing to receive by way of compensation to tolerate a cost. The CVM is an iterative procedure wherein a starting point bid (price) is suggested and the respondent agrees or denies that he/she would be willing to pay for it. The baseline price is then increased to see if the respondent would still be willing to pay it. This goes on until the last accepted bid is reached which is the maximum willingness to pay.

The CVM, however, is aimed at eliciting valuations or bids which are close to those that would be revealed if an actual market existed. The process is therefore prone to several biases (Pearson and Turner, 1990). These biases are classified as: strategic (incentive to "free ride"); design (starting point bias, vehicle bias and informational bias); hypothetical (are bid markets different to actual market bids and why should they be?); and operational biases (how are hypothetical markets consistent with markets in which actual choices are made?)

The willingness-to-pay (WTP) analysis, according to Siebert (1987), depends on a set of factors such as the respondent's attitude toward society, the level of applicable information available, spatial extent of the public good, frequency and intensity of use, and income. Siebert further contends that an individual who is better informed about environmental damages has a higher WTP. Hence, it is a precondition for using the WTP approach that respective individuals must know the damage function. With regards to spatial extent of the public good, it can be expected that the smaller the space occupied by a public good, the easier it is to obtain individual contributions to support it.

The willingness to pay also depends on the type of use and the intensity of the needs. If the public good is necessary to an individual's survival, then the willingness to pay will be higher. The willingness to pay also differs with income and wealth. Some studies show that high-income recipients can compensate for worse environmental quality through private goods while lower income recipients have to tolerate worse environmental quality (Zypan, 1973 as cited by Siebert, 1987).

A central problem of the WTP approach according to Siebert (1987), is the fact that individuals can intentionally distort their answers. One can state a very low value when he fears that the poll may be the basis for later charges or, conversely, indicate a too high value in order to emphasize a certain program.

Very few empirical studies have been conducted on valuing the water resource. In the MFR area, only a few undergraduate studies had been undertaken. One of these is by Soguilon (1996) who used the WTP approach to assess the value of the MFR as a watershed to the households, farmers, and resort owners. His findings indicate that household water users are willing to pay an average amount of ₱95.875 ($2.52) for one-time payment, ₱26.225 ($0.69) for an annual payment, and ₱1.375 ($0.036) as monthly payment for the protection of the watershed function of MFR. For farmer-respondents, the average WTPs were ₱11.07 ($0.29) for one-time payment and ₱5.33 ($0.14) for annual payment. The commercial water users were willing to pay an average of ₱251.67 ($6.62) for a one-time payment, ₱68.00 ($1.789) as annual payment, and ₱10.67 ($0.28) as monthly contribution.

Another study by Cruz (1994) assessed the value of water quality in residential areas within Pleasant Ville and Forestry in Los Baños. For water quality improvement, the forestry campus residents were willing to pay an average of ₱112.67 ($2.965) while the residents of Pleasant Ville were willing to contribute ₱220.30 ($5.797).

Water Pricing

The underlying principle of natural resource pricing is that resource prices should reflect the cost of extraction and any environmental costs involved in extraction and use. The costs of extraction and harvesting are measured by their marginal cost (MC) which is the cost of taking one extra unit of the resource (Espiritu, 1998).

Efficient pricing, therefore, requires the use of marginal, not average cost. In order to adequately balance conservation with use, the customer should be paying the marginal cost of supplying the last unit of water. Yet, these regulated utilities typically are allowed to charge prices just high enough to cover the costs of running the operation. Average cost pricing does not reflect the true cost of providing the service. Hence it promotes an excessive demand for water (Tietenberg, 1992). Simple actions, such as fixing leaky faucets, are neglected where water is priced cheaply.

Potential economic instruments for correct water pricing include charges and tradeable resource use rights/permits (Espiritu, 1998). *Charges* are fees which are paid by a user and can be in the form of pollution charge (effluent charge for water pollution), user charge or product charge. Effluent charges may consist of a charge per unit mass, volume or concentration of pollutant emitted. Polluters face the option of paying the charge or of reducing the quantities emitted, thus responding to an economic incentive to carry out abatement.

User charges are fees paid by individuals upon the utilization of a service. Fees could be used to ration use of natural resources and environmental amenity, especially to reduce congestion and resource degradation. Environmental protection may be deliberately factored into the pricing policies of water authorities and/or enforced through environmental standards imposed by an environment protection agency or by the water

authority itself. *Product charges* are imposed on inputs to economic activities as a means of indirectly controlling adverse environmental impact (Espiritu, 1998).

Tradeable permits are "licenses" that allow firms to pollute up to the level of the standard stated in the permit. The permits can be traded between polluters. It enables polluters facing high abatement costs to bid in the marketplace for the permits. Permit buyers tend to pollute more than permit sellers, yet the overall environmental standard remains unaltered because just enough permits have been issued to achieve the standard quality in aggregate. Reallocating permits between polluters thus minimizes the costs of complying with the standard. It concentrates the costs of control on the polluters who can best afford to adopt abatement measures (Pearce and Warford, 1993).

The choice of the appropriate economic instruments to price the water resource derived from the MFR requires considerable attention of its unique characteristics, institutional setting and the likely response from the various stakeholders. Criteria for evaluating the economic instruments for MFR are as follows: (1) effectiveness in protecting the resource/environment; (2) efficiency gains (do costs justify the benefits?); (3) community acceptance; (4) administrative feasibility; (5) administrative costs; (6) equity and fairness; and (7) political feasibility (Espiritu, 1998).

METHODOLOGY

Review and Analysis of Existing Database. The project relied heavily on data generated by the Forestry Development Center (FDC) of the College of Forestry and Natural Resources, University of the Philippines Los Baños (CFNR-UPLB). The FDC study entitled *Viability of Water Users' Fees and Charges as a Source of Funds for Sustainable Watershed Management* was conducted by Cruz, Bugayong and Dolom (1998). Relevant information from the FDC study and from the Master Plan for the Makiling Forest Reserve Conservation and Development were reviewed and evaluated.

Consultative meetings. A series of consultative meetings with various groups of water users were conducted. Several papers were presented and simultaneous workshops were conducted to discuss the various issues pertaining to water pricing in general, water pricing policies as well as the possibility of pilot testing and fully implementing a watershed fee for water users. The institutional mechanism for the management of the environmental fee for water resources was also discussed together with the mechanism on how the water districts can play more active roles in the management and protection of the MFR watersheds.

The Makiling Forest Reserve

The MFR is one of the major watersheds being managed by the University of the Philippines Los Baños (UPLB). It is located within the municipalities of Los Baños, Bay and Calamba in the province of Laguna, and Sto. Tomas in the province of Batangas,

found in Southern Luzon, Philippines (Figure 1). It has an area of 4,244 hectares and has six major watershed zones (Cruz, et al., 1991).

The UPLB has managed the MFR for the last 31 years. The MFR was established as a reserve in 1910 and was declared a national park in 1920. It was in 1960 that the administration of the Makiling National Park (as it was called then) was transferred from the Commission of Parks and Wildlife to the University of the Philippines. From 1987, the MFR was administered and managed by the National Power Corporation until 1990 when Republic Act 6967 transferred it back to the UPLB (Cruz et al., 1991).

The MFR serves as a showcase for multiple-use resource management. It is valued for its many uses: as a major educational and research resource, as a recreational area, as a gene pool of biological diversity, as a watershed, and as a refuge to wildlife (Master Plan for MFR, 1995).

Water is one of the most important resources in Mt. Makiling. About 20 percent of the people living within the Reserve tap water from rivers, springs, creeks and deep wells. There are eight water intakes in MFR used for tapping the streamflow of perennial streams, mainly for domestic use by residents within the reservation. The average annual streamflow for three major streams are: 0.071 m^3/s for Dampalit, 0.035 m^3/s for Maralas and 0.031 m^3/s for Molawin Creeks (Cruz, et al., 1991).

More than 60 perennial and intermittent streams exist in the MFR. The average stream density is 15 streams for every square kilometer of watershed area. The constance of channel maintenance ranges from 0.04 km to 0.06 km (Cruz, et al., 1991).

Market-Based Instruments for Water Resource

This study is one of several studies under the United Nations Environmental Program (UNEP) funded project on *Development of Market-based Instruments (MBIs) for Makiling Forest Reserve*. Besides water, MBIs are also being developed for other goods and services being generated by the MFR. These include non-timber forest products, recreation and ecotourism, and agriculture.

In the preliminary phase of this study, the team on MBI for water resources relied on the data generated in a study conducted by the Forestry Development Center. The FDC study (Cruz et al., 1998) sought how much people are willing to pay to contribute to the efforts to protect and restore the watershed where their domestic water is coming from. The study made use of contingent valuation method (CVM) to determine what the value of this fee will be - referred to here as ***watershed management fee or*** simply ***fee***. This fee is an amount in addition to the current fees and charges that the users are currently paying to the water districts.

Investment and maintenance costs for the development and protection of the MFR watersheds were likewise estimated to determine how the expected revenue from the imposition of watershed management fee would compare with the amount that is needed to protect, rehabilitate, and manage the MFR.

The underlying principle of natural resources pricing is that resource prices should reflect the cost of extraction, development and protection of the source watersheds to ensure sustained supply of water. The fee should also cover any environmental costs associated with the extraction and use of water. The FDC study specifically asked for that amount which will be used to support the costs of managing and protecting the MFR watersheds for sustainable production of water.

The Proposed Economic Instrument for Water: Watershed Management Fee

The FDC study surveyed various water users in five municipalities surrounding the MFR. The respondents include 3 water districts, 4 community waterworks, 149 residential users, 9 government/religious institutions, 18 resort owners, and 77 commercial/industrial users (Table 1).

Survey results showed that majority of the domestic water users (about 67%) expressed their willingness to contribute an additional amount to the current fees, with the monthly payment being the dominant choice (Table 2). Other terms of payment identified include annual, one-shot deal, percentage of monthly bills, percentage of income, percentage of rental, and any agreed amount.

On the average, the domestic users are willing to pay an additional amount ranging from ₱1.07 or \$0.028/m^3/month to ₱1.45 or \$0.038/m^3/month (Table 3). These translate to about ₱1.37 million (\$0.036 million) fees collected over and above the current water fees collected monthly from domestic users. Domestic users expressed higher WTP for watershed protection and rehabilitation than commercial water users. This may reflect strategic bias since this group (commercial users) is a high water user and any increase in fee on a per cubic meter will translate to a higher expense on their part.

Table 3 summarizes three terms of payment of proposed fees and charges to be piloted for the major types of MFR water users. It also shows the number of users, their average monthly consumption, their WTP, and the computed future collections based on WTP and consumption rates by type of user. For monthly charges, it is possible to collect about 1.37 million pesos (\$36,159), about 2.05 million pesos (\$53,984) for annual charges and about 3.04 million pesos (\$79,947) on a one-shot deal basis.

The said increase in water fees that could be generated from the water resource users through a watershed management fee system appears significant to meet the financial requirements for MFR watershed management. The major programs related to the development and rehabilitation of the water sources in the watershed include people-oriented, conservation and development, and institutional development programs (Master Plan for the MFR, 1995). These programs require a big annual budget which the existing University allotment is unable to sufficiently meet. The proposed fees and charges could cover a large proportion of the budget required to sustainably manage the MFR watersheds as water sources for the community.

The investments for water resources development based on the Master Plan for the Development and Conservation of the MFR are reflected in Table 4. A total of ₱15.77 million ($415,000) is needed for the next 5 years or an undiscounted average of ₱3.154 million ($83,000) each year will be needed to implement the above activities. To generate ₱3.154 million ($83,000) each year, it will only require an additional charge of ₱0.23 or $0.006/m^3 from all current domestic users of MFR water. This amount is way below the additional fees (₱1.07 or $0.028 to ₱1.45 or $0.038/m^3/month) that domestic users are willing to pay.

Even if we double the investment required, the additional charges will only amount to ₱0.46/m^3/month ($0.012) which is still lower than what domestic users are willing to pay. Of course, there are still other users such as the resorts and other commercial and industrial water users who can also potentially pay an additional amount on top of what they are currently paying for using MFR water. Participation of such other user groups can only bring down further the amount of additional fees MFR users need to pay for the protection and maintenance of watersheds to guarantee the sustained supply of clean and adequate volume of water.

Mechanisms for Implementing MBI

In general, the implementation of MBI for MFR water use will be done through a project-implementing set-up (Figure 2). The UPLB through the CFNR will continue to manage the MFR. Donations and collections of the watershed management fee will be managed by the UPLB Foundation, Inc. (UPLB-FI) and an MFR watershed management council will be created to review and approve project proposals.

The final form of the MBI for water use will be determined through the same participatory processes used in drawing up the preliminary results of this study. The various water user groups will continue to play prominent and active roles in developing an MBI that will effectively and efficiently promote the conservation and sustainability of MFR water resource.

The various elements of the MBI for water presented below are based on the preliminary workshops involving user groups. Further activities are required to improve the elements.

- The amount of additional fees water users will have to pay will be based on the actual maintenance and development cost of MFR watersheds. The amount will have to be equitably shared among the various users just as the benefits from proper management of the MFR watershed will accrue to all users.
- The fees that users will pay to cover the cost of protecting and developing the MFR watersheds will be added to the current fees they pay to their water provider. This will prevent any confusion in the payment of various charges for the same product or service. It will also keep the cost of collecting the additional charges to almost nothing.
- An account for the MFR watershed will be established and managed by the UPLB Foundation, Inc. (UPLBFI). This will facilitate the safe handling and quick release of funds that will be generated from the collection of additional water users' fees.

- The use and allocation of watershed funds will be governed by a project management group.
- Other schemes on how to generate funds for MFR watershed management may be considered. The concept of "adopt-a-watershed area" has been raised in one of the more recent consultations with some institutions operating within the MFR and UPLB campus. Instead of paying a watershed management fee in addition to current fees and charges, these institutions can manage a certain portion of the MFR watershed from its rehabilitation to its maintenance and protection. These activities will have to be valued through proper pricing and the mechanisms for implementation will have to be studied and agreed upon by the concerned sectors through the same participatory approaches used in the study.

Pilot Testing of the Economic Instrument

Implementation of the MBI for water will be pilot-tested after the mechanisms for the collection and management of the funds have been developed and agreed upon by the various user groups and other interested parties and individuals. Lessons from the pilot-testing phase will be documented and processed for future reference. It is expected that a successful implementation of the economic instrument will lead to the replication of the project in other watersheds in the Philippines. Hence, the process documentation of the pilot-test will be immensely useful.

Follow-through Activities

To improve further the design on the MBI for the watershed rehabilitation by water users, the following are essential:

1) Improving the database on streamflow and groundwater resources from and within MFR. This will involve the monitoring of the quantity and quality of streamflow from major streams of MFR.
2) Establishment of a database of water users and consumption patterns within and around the MFR watersheds.
3) Conduct of interactive participatory workshops to refine the various elements of MBI initially developed (i.e., amount of additional fees to be collected from domestic, agricultural, commercial and industrial users, mode of collection, management and use of funds, and other related elements).
4) Development of detailed protection and development plans for the major watersheds of MFR.

SUMMARY

This study made use of the data generated by a survey conducted by the Forestry Development Center among various water users in the vicinity of MFR. The willingness of respondents to pay (WTP) for the management of MFR watersheds was determined through the contingent valuation method (CVM). Although subject to certain biases, the method was able to elicit a variety of terms of payment with monthly WTP preferred by almost half of the respondents. The average WTPs generated in the study are indicative of

the respondents' valuation of the environmental benefits of properly managing the watersheds as main source of their water. The users are willing to pay an additional amount for watershed manageme nt on top of existing water fees and charges being collected by their water providers/district.

Based on the average WTPs, the study was able to project monthly, annual and one-time collections from domestic water users served by the local water district s alone. These amounts were then compared with the proposed 5 -year investment cost for the rehabilitation, development and protection of MFR. Results showed that the watershed fee based on the domestic water users' WTP is a viable and substantial source of funds for MFR watershed management.

Initial consultations with various sectoral users generated positive response to the collection of a watershed management fee from water users and fund management by a project-implementing set-up that addresses the issue of quick release of funds. Participatory approaches in coming up with a set of watershed management fees and fund management mechanisms require more detailed data on costs and benefits. Actual production costs and income from water extraction and deliv ery as well as watershed management are currently being analyzed to come up with realistic fees that will be agreed upon and equitably shared by the various water users.

Despite the promising results of this study, exploration of other potentially useful and more accurate mechanisms for determining the economic price of water and other watershed resources will be made. Additionally, establishment of endowment fund and other similar schemes for generating funds to finance the development and protection of MFR will also be studied.

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Table 1. Respondents by type of water user and municipality.

USERS	MUNICIPALITY	NO. OF RESPONDENTS
Water District	Calamba	1
	Los Baños, Bay, Calauan	1
	Sto. Tomas	1
	Sub-total	3
Community Waterworks	Sto. Tomas	4
Residential	Bay	28
	Calamba	37
	Calauan	29
	Los Baños	24
	Sto. Tomas	31
	Sub-total	149
Commercial/Industrial	Sto. Tomas	13
	Bay	13
	Calamba	20
	Calauan	4
	Los Baños	27
	Sub-total	77
Swimming Pools/Resorts	Calamba	10
	Los Baños	8
	Sub-total	18
Government Institutions	Sto. Tomas	2
	Bay	1
	Los Baños	6
	Sub-total	9
	TOTAL	260

Source: Cruz et al., 1998.

Table 2. Average amount that respondents are willing to contribute for management of MFR watersheds.

TERMS OF PAYMENT	RESIDENTIAL	GOVERNMENT/ RELIGIOUS	RESORT	COMMERCIAL/ INDUSTRIAL
Monthly WTP (₱) **($)**	₱36.19 **0.952** (n= 48)	₱75.00 **1.974** (n= 2)	₱55.00 **1.447** (n= 8)	₱15.00 **0.395** (n= 6)
Annual WTP (₱) **($)**	₱54.09 **1.423** (n = 11)	none	₱75.00 **1.947** (n = 2)	₱82.00 **2.158** (n = 5)
One-shot deal WTP (₱) **($)**	₱ 80.00 **2.105** (n= 4)	none	none	₱ 13.67 **0.36** (n= 6)
Other Terms (n)				
• **2-30% of monthly bills**	(3)	(3)		(11)
• **1,5% of income**	(1)		(1)	
• **5% of rental**			(1)	
• **Any agreed amount**	(5)	(2)	(5)	(2)
• **No answer**	(24)	(2)	(1)	(17)
TOTAL (n)	96	9	18	47

Source: Cruz et al., 1998.

Table 3. Proposed fees and charges for MFR water users.

ITEM	CWD		LWD		STWD	Total	
	Domestic /Gov't	Comm'l	Domestic /Gov't	Comm'l	Domestic /Gov't	Comm'l	Domestic/ Gov't
No. of service connections	16,281	909	11,462	785	10,265		38,008
Ave. consumption/mo. (m^3/mo.)	33.71		27.00		25.00		28.57
Total consumption/mo. (m^3/mo.)	548,833	30,642	309,474	21,195	256,625	51,837	1,114,931
Monthly WTP (₱) / m^3	1.07	0.45	1.34	0.55	1.45		
($)	0.028	0.012	0.035	0.014	0.038		
Total monthly collection (₱)/mo.	**587,251**	**13,789**	**414,695**	**11,657**	**372,106**	**25,446**	**1,374,052**
($)/mo.	**15,454**	**363**	**10,913**	**307**	**9,792**	**669**	**36,159**
Annual WTP (₱) / m^3	1.60	2.43	2.00	3.04	2.16		
($)	0.042	0.064	0.053	0.080	0.057		
Total annual collection (₱)/yr.	**878,132**	**74,461**	**618,948**	**64,433**	**554,310**	**138,894**	**2,051,390**
($)/yr.	**23,109**	**1,960**	**16,288**	**1,696**	**14,587**	**3,655**	**53,984**
One-shot WTP (₱) / m^3	2.37	0.41	2.96	0.51	3.20		
($)	0.062	0.011	0.078	0.013	0.084		
Total one-shot collection (₱)	**1,300,733**	**12,563**	**916,043**	**10,809**	**821,200**	**23,373**	**3,037,976**
($)	**34,230**	**331**	**24,106**	**284**	**21,610**	**615**	**79,947**

* CWD - Calamba Water District; LWD - Laguna Water District; STWD - Sto. Tomas Water District
Assumptions:
1. Total consumption/mo. = no. of service connections x Ave. consumption/mo.
2. WTP/m^3/mo = Ave. WTP / Ave. monthly consumption
3. Total collection = WTP/m^3/mo x total monthly consumption

Table 4. Five-year investment cost for water resources development in MFR.

INVESTMENT ITEMS	5-YEAR INVESTMENT COST	
	(₱)	($)
• Rehabilitation/restoration of forest cover	15,000,000.00	394,736.84
• Meteorological station	500,000.00	13,157.89
• Automatic water level and quality monitoring equipment	270,000.00	7,105.26
TOTAL	15,770,000.00	414,999.99

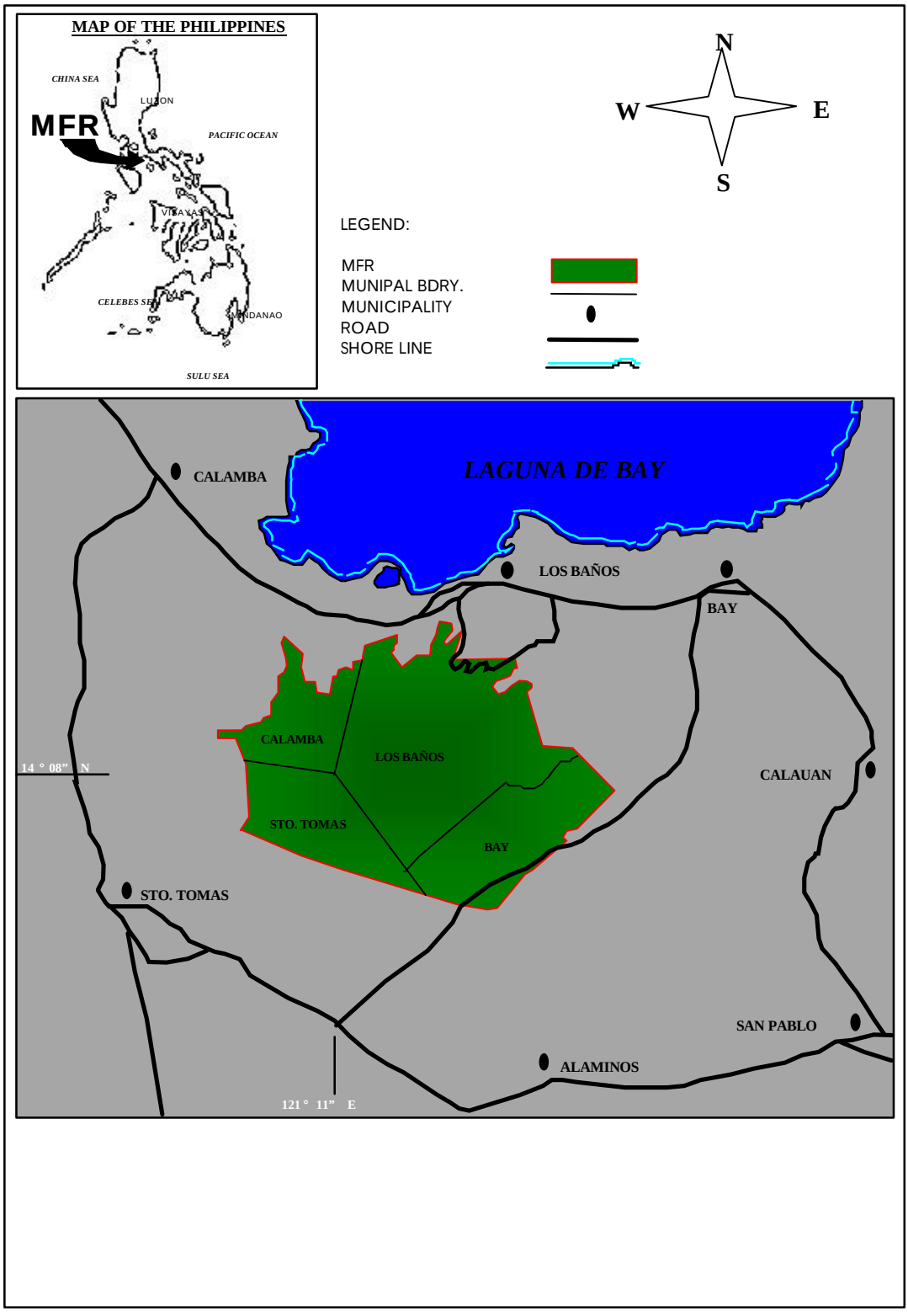

Figure 1. Location map of the Mt Makiling Forest Reserve.

Figure 2. Institutional framework for MFR investment program.