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WATERSHED LAND USE ALLOCATION: POTENTIAL MECHANISMS FOR ADDRESSING SOCIETAL CONCERNS

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The previous chapter by Cruz (1997) outlined the conceptual framework for watershed-based forest land-use planning and emphasized the following objectives of watershed management, to wit:

1. streamflow regulation;
2. soil resource conservation for enhancing on-site productivity, erosion control and infiltration capacity;
3. optimum production of goods and services;
4. poverty eradication in the uplands; and,
5. environmental stabilization (including climate change mitigation).

This chapter follows through the process of addressing these objectives in two parts. First, we summarize a sampling of planning tools to provide ideas on how multiple objectives for watershed management may be tackled. Second, we explore the mechanisms for allocation, with due emphasis on avenues for resolving conflicts. Finally, future directions for subsequent work are suggested.

PLANNING TOOLS FOR WATERSHED MANAGEMENT

There is no shortage of tools for examining forestland allocation for addressing multiple objectives. Various attempts include the application of mathematical optimization models for addressing multiple objectives and valuation of alternative land-uses.

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Among the optimization models are:[1]

1. goal programming for the Mt. Makiling Forest Reserve (Balangue, 1979);
2. interactive programming for the Cagayan Valley Region (Araño, 1985);
3. STEM algorithm application (Contreras, 1985);
4. logit decision model for land use allocation (Gregorio, 1990); and
5. valuation and evaluation of management alternatives for a mangrove forest (Janssen and Padilla, 1996).

These models vary in terms of their unit of application, incorporation of on-site and off-site concerns, data used for valuation of alternative uses, and explicit consideration of the concerns of various stakeholders.

In terms of unit of analysis, the studies range from the assessment of land classification units by Gregorio (1990), to analysis of larger forest areas or regions by the other four studies. Since all five studies examine multiple objectives, they address both the on-site and off-site beneficiaries of alternative forestland uses. The first four studies incorporate off-site considerations such as watershed protection or keeping sediment loads within a pre-determined limit by including such concerns among the constraints of the optimization problem. Additionally, the more recent study by Janssen and Padilla (1996) also includes global concerns such as biodiversity and carbon emissions.

The first four studies, having been conducted before the nineties, required considerable inputs for developing the computer programs for the mathematical optimization problems. In terms of data requirements, these studies used a combination of stylized facts and information specific to the area of application that was generated by previous analysis.

On the other hand, the fifth study by Janssen and Padilla (1996), having benefited from more recently available, powerful computing services (both hardware and software) also spent resources for generating site-specific information. Moreover, the authors, both being economists, addressed in more detail the potential trade-offs among

1. Earlier applications of computer simulation and operations research models focused on forest-based industry concerns including balancing of supply and demand, such as the studies of Revilla (1976), Rapera (1978), and Camacho (1983).

efficiency, equity and environmental objectives. In the process, the concerns of various stakeholders, including the fishpond owners, fuelwood gatherers, public decision-makers and globally oriented environmentalists were examined. A similar framework for examining the political economy of land use allocation was earlier implemented by Contreras (1985), albeit sans valuation of different goods and services.

The multiple criteria decision models that were explored by Balangue (1979), Araño (1985) and Janssen and Padilla (1996) applied different weights to multiple objectives, reflecting stakeholder preferences and degrees of importance, to some extent. The authors unilaterally determined these weights; future applications should include a process for generating or validating such weights by the stakeholders concerned.

All these studies are important **initial** mechanisms for organizing information in a manner that allows the various parties interested in different watershed goods and services to assess the options for watershed management. To resolve conflicts among various uses and stakeholders, greater effort at valuing goods and services needs to be exerted that would pave the way for potential allocation mechanisms to be implemented as outlined in the next section.

EXPLORING ALLOCATION MECHANISMS

The process for addressing multiple objectives for various watersheds is getting more complicated by the fact that: most watersheds either have settlers, are claimed by interested parties, or both; different agencies and governing units oversee watersheds; demands for various goods and services are ever increasing; and institutional arrangements, including property rights, are neither well defined nor stable.

To minimize the potential for conflict and explicitly address equity concerns, planning and implementation must be participatory at various levels. The potential mechanisms for allocation have varying degrees of participative decision-making. Further, their implementation hinges on where the property rights are vested and the institutional mechanisms that are available for resolving competing uses.

The Command and Control Approach (CAC)

The Command and Control Approach characterizes the situation where the resource manager with prime responsibility for managing a watershed allocates and regulates its use by other parties through enforcement of detailed rules and regulations that are unilaterally determined. The rules may range from broad strokes such as zoning, to detailed specification of the technologies for using the resource (e.g., no portable saws and mini-sawmills). Regulation by rule-making is implemented through a system of sanctions and penalties on the violations. This system works if the resource manager is all-knowing (on supply and demand and on environmental standards) and possesses the resources required for effective monitoring and enforcement. It is usually practiced under socialist planning regimes.

The CAC system becomes problematic when there are numerous, competing users, information on impacts is highly uncertain, the financial resources for enforcement are not available and the implementors are corrupt. This centralized system tends to be expensive to implement and curtails flexibility among users. The sources of inefficiency, e.g., high cost of achieving desired objectives, include uniform specification of rules across both high-cost and low-cost users, lack of incentives for technological development, and the resources wasted on attempts to circumvent unreasonable regulations.

Examples of the CAC approach include: mandating all forest licensees to set up processing facilities at their areas of operation; requiring all community-based forest operators to practice carabao-logging, allowing all forest products gatherers to collect amounts sufficient only for household use, and cutting bans.

The Market-based Instruments Approach (MBI)

The Market-based Instrument Approach simulates the use of market mechanisms for inducing private user groups to act in a socially desirable manner. Regulation through the market includes using economic instruments to modify private behavior and simulating a market for watershed goods and services. Examples include: using a tax that reflects damages to penalize the erring user groups; requiring reforestation bond that is forfeited in case of violation, and bidding out tradable permits to use a good or service derived from a watershed.

The prime advantage of market-based instruments is flexibility of choices among the regulated parties. This flexibility brings about lower cost mechanisms for achieving specific objectives and faster adoption of alternative technologies.

Market-based mechanisms also require prior information on environmental standards and monitoring of behavioral change as well as environmental impacts. MBIs work best when there are markets - e.g., there are sufficient enough players to preclude collusive behavior. Examples include transferable development rights (Canada), tradable water rights (Thailand), royalties paid for exclusive access to gene pools by pharmaceuticals (Costa Rica), carbon credits/offsets (international firms), cost recovery for irrigation system fees, and payments for water sourced from another state in the U.S.A.

Both the CAC and MBI schemes encourage private users of environmental and natural resources to internalize the social costs of their actions, although the process of internalization is more flexible for the MBIs. In practice, many schemes that are being tried out are actually combinations of CACs and MBIs thereby taking advantage of the positive features of both approaches. For example, the sanctions that are formulated under rule-making regimes may be market-determined, as in the case of damages to be paid out by a mining firm found responsible for polluting downstream-irrigated riceland farmers. Another example is an environmental standard that is first specified to reflect some measure of carrying capacity upon which to base the amount of user right to market or bid out.

FUTURE DIRECTIONS

The optimization models that were discussed in the previous section could actually provide the initial conditions for specific standards and targets to be explored at the level of a watershed management unit. Modeling allows for information on various dimensions of watershed management to be organized in a cohesive manner. Additionally, the optimization models that incorporate valuation of costs and benefits and stakeholder analysis could be used to anticipate the potential trade-offs from alternative allocation schemes and anticipate the sources of conflict.

Transforming various bio-physical data into monetary values, as is done through economic valuation, enables the various stakeholders to assess both the magnitude and the incidence of impacts – i.e. who bears the costs, who earns the benefits, and how much. Stakeholders are thereby enabled to actively participate in decision-making: avenues for conflict resolution become visible, such as payments that can be made to make everybody better off when compared to the initial conditions.

The expertise that is needed for implementing optimization models and economic valuation is available in the country. Transdisciplinary effort is needed to rework these tools into watershed specific analysis that is capable of generating practicable solutions to urgent problems. What is required is for the specialists to go several steps further in making their tools available and co-generating information to proactively solve pressing problems.

At best, the application of such tools should reveal the directions for resolving long-lived, unresolved debates, such as the commercial logging ban, cutting ban in watershed reserves, the area to be allocated for NIPAS, and the final forest line. At the same time local, site-specific information should be generated in a consistent manner that will allow for analysis of potential multiple uses, preferences of user groups, and the costs and benefits associated with various choices.

The current organizational work being conducted for community-based forest management paves the way for the previously disadvantaged groups of upland settlers and indigenous peoples to actively participate in both the planning and use allocation stages of watershed management. Additionally, the Internal Revenue Allocation scheme should encourage local decision-makers to eventually develop environmental monitoring and enforcement capability as well as create higher demand for environmental and natural resource pricing at the local level. A critical mass of practitioners with various specializations is needed to respond to this challenge.

At the national level, what is urgent is for the property rights regime to be clarified, defined, and secured. Subsequently, capability for arbitration needs to be developed at the DENR and the other agencies that have been designated initial stewardship of specific watersheds.

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