Integrating Social Preference in GIS-Aided Planning for Forestry and Conservation Activities: A Case Study from Rural SE Asia

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ABSTRACT / Land-use planning using geographic information systems (GIS) commonly emphasizes biophysical spatial data; however planning can be improved by integrating spatial sets of socioeconomic data into the GIS. As an example, we compared a traditional GIS-aided forestry planning protocol that considered only biophysical suitability, with an integrated GIS-aided approach that incorporated both biophysical and socioeconomic suitability. The analyses were conducted for the planning of plantation investments in the Kyaukpadaung Township in the dry zone of central Myanmar. The traditional approach used three biophysical layers for suitability: land use, slope, and accessibility. In contrast, the integrated GIS approach included biophysical suitability data, perceptions and preferences of local villagers towards forestry (social suitability), and quantitative socioeconomic data. The results indicated that the integrated approach provided two principal benefits over the traditional method. First, the integrated method resulted in a more precise idea of suitable sites for plantation investment that could benefit more rural people and also lead to greater investment efficiency. Second, incorporating social preference into the GIS takes into account the crucial element of social capital (viz., social preference), which should lead to higher levels of community acceptance of plantation projects because those plantations would be established on socially suitable land. A second GIS exercise showed how conservation investment decisions could be informed using the integrated method. The results of this study support the idea that GIS-aided planning activities can be enhanced through the incorporation of social data into the analysis. When applicable, spatial data collection efforts for GIS-based planning exercises should incorporate spatial socioeconomic data.

The management and conservation of natural resources often requires an explicit spatial component. Examples include reserve design (Scott and others 1993, Strittholt and Boerner 1995, Smith and others 1997, Howard and others 2000), managing the human–environment interface (Schmidt and others 1995, Dale and others 1998, McCracken and others 1999, Thompson and Jones 1999), wildlife conservation (Worah and others 1989), land prioritization (Fox and others 1996, Dutta and others 1997, Wright and Tanimoto 1998) and ecosystem management (Cox and Madramootoo 1998, Verissimo and others 1998). With the increasing use of geographic information systems (GIS) for planning of resource management projects, new applications of spatial assessment continue to arise. The use of GIS in resource management is now commonplace and is critical for many nongovernment and government conservation programs. Therefore it is worthwhile to investigate ways in which resource management and conservation can be enhanced through improvements in spatial assessment methods.

An impressive volume of research, both theoretical and empirical, has shown that it is important to consider social dimensions for forest conservation and management (e.g., Bushbacher 1990, Ostrom 1990, Gilmour and Fisher 1991, Colchester 1994, Carter and others 1995, Arnold 1997, Kremen and others 1999, Gibson and others 2000) and for the allocation of natural resources in general (e.g., Lam 1998, Ostrom 1999, Shivakoti and Ostrom 2001). To that end, some spatial (GIS) studies that incorporate explicit social components have been published (e.g., Fox and others 1996, Kessler and others 1998, Lakshmi and Dutta 1998, Walsh and others 1999). However, many GIS-aided planning projects for resource management still place only minor weight on human perceptions toward forest conservation and management, even though they are critical to the success of such projects (Worah and others 1989, Schreier and others 1994, Strittholt and Boerner 1995, Smith and others 1997). Despite the
awareness of the scientific community about the benefits of incorporating local preferences and perceptions into planning activities, there is still a conspicuous dearth of GIS-based planning activities using this strategy.

The research presented here is an attempt to show how incorporating social parameters with biophysical parameters into a GIS can improve site selection methods for forestry and conservation activities in rural settings. The objective of the project was to investigate how incorporating socioeconomic data with biophysical data (hereafter referred to as integrated data) improves GIS-supported planning, using forestry activities as an example. The term “integrated data” is central to this study and specifically refers to the utilization of quantitative and qualitative social data derived from village surveys with biophysical environmental data in order to designate the optimal social and biophysical environment in which forestry activities will take place. The term “forestry activities” is general and refers to the entire array of forest conservation and management activities, including activities such as plantation establishment and reserve designation.

To evaluate the utility of integrated data on GIS-supported forestry planning, we present a case study from the dry zone of Myanmar, whereby we compared the outputs from two GIS-aided planning techniques. The first technique—hereafter referred to as the traditional method—is currently used by the Forest Department of the Ministry of Forestry, Government of Myanmar, and relies primarily on biophysical suitability. The experience of one of us (Thiha) as a forest department officer in Myanmar provided familiarity with this method. The second method—hereafter referred to as the integrated method—also used biophysical data but in addition incorporated local peoples’ perceptions and preferences regarding those biophysical parameters, as well as spatial socioeconomic data relevant to the implementation of forestry projects. We directly compared the results of the two techniques for planning the establishment of fuelwood plantations, an essential forestry activity in the dry zone of Myanmar (Khiang 1993). After comparing the two techniques, we present a second planning exercise using the integrated GIS method in which we mapped potential areas for conservation forest (protected areas).

Investigating an integrated GIS-based planning model in Myanmar is highly relevant because there is a move within the country to change the way in which government-established plantations are managed. Previous to 1995, all government-established plantations were under direct management of the Forest Department. However in 1995, following the example of other Asian countries—particularly Nepal—where the expectation has been for success with community forestry programs (but the evidence has been mixed, see Gilmore and Fisher 1991, Fisher 1992, Häusler 1993, Webb and Gautam 2001, Gautam and others 2002), the Myanmar Forest Department began integrating community forestry into its activities. In 1995 the Director General of the Forest Department drafted the Community Forestry Instructions (Union of Myanmar Forest Department 1995), which was a first attempt to begin shifting forest management rights to local communities. The driving force behind the Community Forestry Instructions was lack of budget and human resources for Forest Department activities, which was insufficient to maintain sustainable, government-controlled plantations. Along with the publication of the Community Forestry Instructions in 1995, the department mandated that a minimum of 10% of all new plantations had to use community forestry as the management tool. There is no upper limit to the proportion of government-established plantations managed through community forestry.

Although this paper does not argue for or against community forestry, we anticipate that the Myanmar Forest Department will continue along the path towards widespread community forestry adoption, similar to other countries in Asia (International Tropical Timber Organization—Department of Environment and Natural Resources 1996). Therefore, in addition to providing results of interest to the general scientific and planning communities, the results of this study can serve as a specific case study for the Forest Department if it modifies GIS-based planning activities to include social criteria. This study can provide preliminary guidelines for planning as the Forest Department grapples with how to plan the devolvement of authority of forest management to the local level, and where to invest in community-managed plantations.

It should be clearly noted that the GIS-aided planning exercise reported here has been undertaken within the Myanmar Forest Department’s resource-oriented management framework. Although contemporary strategies emphasize an ecosystem-based approach (see Yaffee 1999 for a review), it would be inappropriate to argue for a change the current orientation of the Myanmar Forest Department with this research. Rather, we present this case study with the hope that, using this example of how social data can and should be integrated into GIS-aided planning, ecosystem-oriented management projects using GIS-aided planning will adopt this strategy when possible.