

## Preparation of a Zoning Plan for the Madu Ganga Special Management Area

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### Introduction

The Madu Ganga estuarine lagoon is famous both nationally and internationally due to its aesthetic value and rich biodiversity. It is located in Balapitiya and Karadeniya Divisional Secretary's Divisions. Four previous studies related to Madu Ganga can be identified. The wetland site report prepared by the Central Environmental Authority (CEA) in 1997 (CEA and EUROCONSULT, 1997) was the first extended study on this. In 1997, the Special Area Management (SAM) Plan for Madu Ganga estuarine lagoon was done by a management committee to develop an integrated management approach to conserve Madu Ganga. IUCN, Sri Lanka carried out a systematic assessment on biodiversity for safeguarding ecological functions, resources and values of Madu Ganga estuary for conservation and future sustenance of biodiversity (Bambaradeniya *et al.*, 2002). In 2002, Central Engineering Consultancy Bureau (CECB) conducted a study to identify the process that results in the formation of sand bar in the lagoon mouth (CECB, 2003). Many of these studies (SAM Plan 1997, Bambaradeniya *et al.*, 2002) have pointed out the necessity of the preparation of a zoning plan for better management of the SAM. Coastal Resource Management Project (CRMP) has recognized zoning as a strategy for the protection and enhancement of this site.

The general objective of this study was to prepare a zoning plan for Madu Ganga SAM based on environmental principles and stakeholder views obtained through stakeholder consultation. The specific objectives are to guide development activities within the socio-cultural context and in a sustainable manner, to conserve ecologically important natural habitats and to improve economic potential of the estuary and surrounding area.

### Methodology

In this study, primary, secondary and tertiary data were used. Geographical Information System (GIS) and remote sensing information were considered as primary data which played

a vital role. 1:10,000 topographic maps of the Survey Department (2001) were used and those were updated using geometrically corrected satellite imageries (IKONOS images, 2005). This paper explores the application of fuzzy set theory in Multi Criteria Decision Making (MCDM) and GIS for zoning. These techniques were used for demarcating the most compatible zoning map according to the critical issues of the study area. The criteria used were 1) environmental protection, 2) flood retention, 3) economic development, 4) socio-cultural importance and 5) residential suitability which were selected using an extensive literature survey and field work.

Using expert knowledge and stakeholder consultation, criteria maps were produced by ranking. Using a pair-wise comparison matrix following the analytic hierarchy process, weights for each criterion were calculated. 1 to 9 ranges were used for weighting. Nine implies *extremely important* and one implies the *least important*. In accordance with the level of importance, weights were given by expert judgment comparing a pair of criteria at a time. The weighted value of each criterion was multiplied by ranks of each map layer. The maps were created for each criterion using new values. Then, polygons with the highest one third of each criterion were separated using a query process. The final zoning map was created by union of separated areas of each criterion map.

### Results and discussion

According to the selected criteria, a zoning map with five zones was produced with recommendations for each one. Zones are protection, flood retention, economic, residential and socio-Cultural (Figure 1). If adequate time and financial resources were available it would have been possible to refine or further subdivide this zoning plan. This is a limitation of this study.

The zoning plan identified series of zones with various restrictions and permitted activities. The Madu Ganga estuary and its mangrove

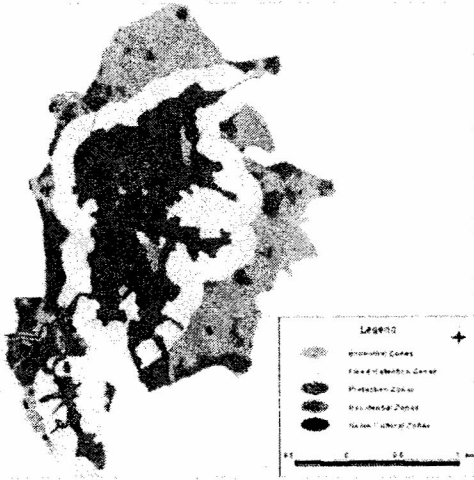


Figure 1. The Zoning map for Madu Ganga SAM

covered border area were defined as *Protection Zone*. Since it is sensitive, the highest conservation value should be given. Especially mangrove area in north eastern part of the estuary should be strictly protected and access restricted to permit holders only. The estuary can be used for recreation and eco-tourism purposes with a certain amount of restrictions. Motor boats should not be permitted to go closer to the mangrove vegetation.

The buffer area between the lake and the upland unit comprises the *Flood Retention Zone*. This zone is subjected to flooding due to constriction of the mouth of the estuary by the formation of a sand bar. This is a very sensitive area and there is a need to prevent all constructional activities. *Economic Zone* consists of agricultural lands, commercial and service centers.

Cinnamon cultivation is prominent among upland crops in this area and there is considerable demand for this in the market. The excessive use of agro-chemicals in cinnamon plantation should be restricted to protect water quality in the Madu Ganga

estuary. Soil conservation methods should be mandatory for upland agricultural lands.

In the *Socio-Cultural Zone*, there are many ancient Buddhist temples, churches and a mosque. It is possible to improve eco-tourist activities without harming the socio-cultural values of this area. The *Residential Zone* consists of the habitat of local population and areas which are potential for expansion of habitats in the future.

### Conclusions and recommendations

According to the overall findings, the following recommendations can be presented to facilitate sustainable use of Madu Ganga estuary. They are establishing a single policy formulation institutional structure covering Madu Ganga SAM, establishing an information centre within Madu Ganga SAM for educational and awareness activities and integrating local people in planning and monitoring activities of conservation area. If more detailed information is available, more refined zoning maps can be developed using the same methodology. There is a possibility of further subdivisions of these zones using the participatory GIS approach by integrating local knowledge.

### References

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