GIS BASED WETLAND SUITABILITY ANALYSIS IN THE JAFFNA PENINSULA.

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Introduction

Wetlands are among the world's most productive environment and important for ecological process as well as for their rich biodiversity. Unique and rare plant and animal species can be found in different wetlands all over the world. Sri Lanka is a tropical country and it has rich biodiversity. Number of wetland conservation projects was implemented to maintain wetland in Sri Lanka. However, such initiatives have not been implemented in the Jaffna Peninsula during the last thirty years of war. The war effects are clearly visible in almost every aspect of socio economic and environmental system of the region. Particularly, wetland vegetation was destroyed for security purposes and disturbed bird habitat areas during the war. On the other hand, wetlands are affected by human unawareness activities like cutting wetland vegetation, waste disposal, fishing and mining. The wetland resources of Jaffna peninsula have been undergoing improper utilization which caused various human, biological and environmental problems. However, there are opportunities to utilize the wetland resources for variety of economic, environmental purposes in the Jaffna peninsula. Mostly, at present, these resources are used for only economic purposes with very limited knowledge in wetland conservation and management. Specially, areas with rich of biodiversity can be used for conservation and ecotourism development. There is urgent need to formulate plans to achieve optimum sustainable benefit from these resources. There are lack of conservation measures and management activities regarding the wetland resources in this area. Therefore, need to identify the suitability, with the purpose of achieving optimum benefits from these wetland resources for variety of purposes. The main objective of this study is to identify the suitable lands for different land use goals representing environmental, economic goals of the study area.

Materials and Methods

The study area is the wetland region of the Jaffna Peninsula. The total area is $628K.m^2$ and the topography of this area is low. Three salt water lagoons are in the study area. The Thondaimanaru and UppuAru Salt water lagoons pass through the main land area of the Jaffna Peninsula and Jaffna. Lagoon has direct contact with sea water. They function as natural

drainage during the rainy season. Agriculture and fishing are the main economic activities in the study area.

Both primary and secondary data have been used for this research. Primary data have been collected through various methods such as image interpretation, field observation, interviews and stake holders meeting. Secondary data were collected from the Government and Non-governmental institutions harnessed for this purpose. The Secondary data used in this research are listed in Table1.1.

This study was carried out mainly based on three steps: define goals, criteria identification and land suitability analysis. Land suitability for land use goals was carried out using GIS based spatial multi-criteria analysis. The important steps of land suitability analysis are defining of goals and objectives to guide the decision to be taken. Identification of different goals in the study area was based on different information gathered from field visit, interview, and literature review. These goals were related to environmental and economic activities of the study area. Based on the information collected in the study area five goals were identified. Conservation and ecotourism are identified as environmental goals whereas fishing, agriculture and crushing and mining are defined as economic goals..One of the most useful applications of GIS is the land suitability analysis. The GIS-based land-use suitability analysis has been applied in a wide variety of situations. The aim of land suitability analysis is to identify the most appropriate spatial pattern of land uses according to specific requirements and preferences (Pereira &Duckstein, 1993). Land suitability analysis of this study has been carried out using Spatial Multi Criteria Analysis(SMCA) in the Arc GIS environment. SMCA is a decision making techniques which combines and transform geographical data in to decision (Carver, 1991). This method is used for selection of a suitable sites for different goals on the basis of various criteria. The following steps were carried out for land suitability analysis under the spatial multi criteria model of Arc GIS: Identification of criteria, data conversion and reclassification, establishing the criteria weights and weighted overlay analysis

Table:1 List of secondary data and its sources

Data Type	Data source	Scale/Year
Land use	Quick bird Satellite Survey Department.	2010 1:100000 (1984)
Elevation	Satellite image- ASTER	2010 (30 m resolution)
Topographical maps	Survey Department, Colombo.	1:50000 –(2010)
Soil	Irrigation Department, Jaffna.	1:50000-1989

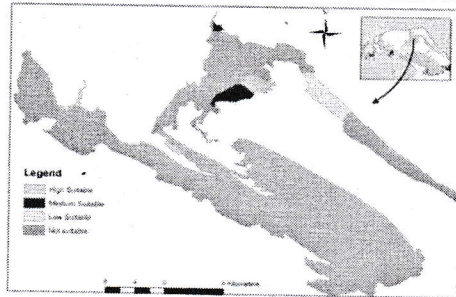| Fisheries | Department of Fisheries, Jaffna. | 2012, 2013 |
Agriculture	Agrarian service centres, Karaveddy, Putter, Chavakachcheri.	2012, 2013
Economic data	Statistical hand book District Secretary Divisional secretaries	2012
Environmental related data	Central environmental Authority, International union for conservation of nature	Various years

Result and Discussion

Result of this study, suitable sites for conservation, ecotourism development, agriculture, crushing activities, fishing were identified and mapped in the wetland. This suitability study shows the different suitable level (high, medium, low and notsuitable) for environmental and economic goals. It reveals that the largest suitable area was identified for economic goals particularly for fishing activity. Settlement and industrial goals have smaller suitable area in its extent.

Conclusion

This research have been given ideas to optimum utilize the wetland resources.

By implementing the proper plan, wetland resources can be utilized in the sustainable basis. At present, reconstruction and rehabilitation activities have been carried out in various sectors to restore the war effected area in the Jaffna peninsula. It is a high time to implement the environmental management activities regarding the wetland ecosystem in the study area. Therefore, wetland suitability study has been chosen and this will help to understand the suitable sites for different activities which promote the wetland resource management with integrating environmental and economic purposes.

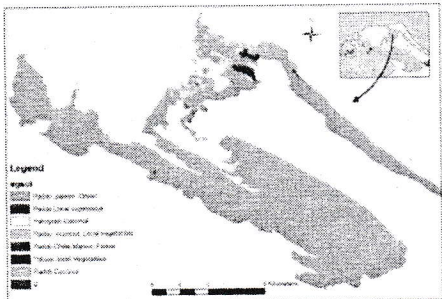## Suitable Sites for Wetland Conservation

Area for conservation

Level of Suitability	Area	
	ha	percentage
High suitable	2900	17
Medium suitable	1900	11
Low suitable	2700	15
Not suitable	9500	57

Suitable Sites for Ecotourism
Area for Ecotourism

Level of Suitability	Area ha	Area percentage
High suitable	950	5. 5
Medium suitable	700	4. 0
Low suitable	2430	14. 0
Not suitable	12920	76. 5
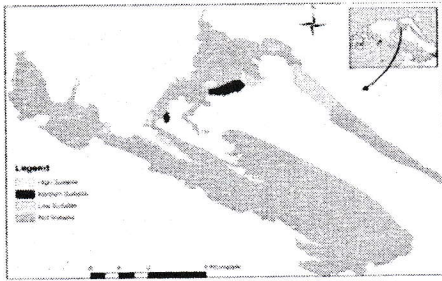
Physical suitable land for different crops

Area for different crops

Crops	Area (ha)	Percentage
Paddy	1200	7
Palymyrah	2400	17
Palses	950	5. 5
Coconut	2300	13. 5
Local vegetables	175	2. 0

Suitable sites for Fishing

Area for Fishing

Level of Suitability	Area ha	Area percentage
High suitable	23500	58
Medium suitable	1595	4. 0
Low suitable	2600	6. 5
Not suitable	12805	68. 5
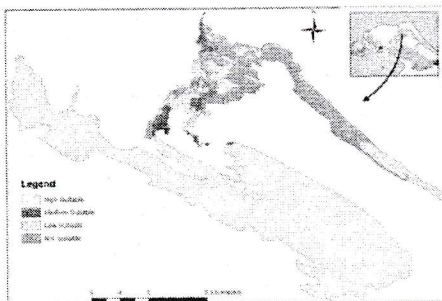
Suitable site for Crushing Industry Industry

Area for Crushing

Levelof Suitability	Area ha	Area percentage
High suitable	707	4. 0
Medium suitable	1630	9. 5
Low suitable	3471	20. 0
Not suitable	11192	66. 5

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