POLICY ANALYSIS OF COASTAL ECOTOURISM DEVELOPMENT ON MUARA ANGKE MANGROVE ECOSYSTEM, JAKARTA BAY, INDONESIA

MYINT THU ZAR
Yezin Agricultural University, Myanmar

DIETRIECH G. BENGEN
Pusat Kajian Sumberdaya Pesisir dan Lautan
Institut Pertanian Bogor
e-mail:dieter@indo.net.id

DANIEL R. MONINTJA
Fakultas Perikanan dan Ilmu Kelautan
Institut Pertanian Bogor

ABSTRACT

The mangrove ecosystem is one of important ecosystems in the tropics and has great economic and ecotourism potential. The multiple roles of mangrove ecosystems in coastal ecotourism areas are now well recognized in Indonesia. Ecotourism is ecologically sustainable tourism that is related with forest environmental and cultural understanding, appreciation and conservation.

Information on mangrove ecosystems of the Jakarta Bay is mostly concerned with the flora and fauna aspects. The mangrove ecosystems in the area have a very limited diversity. The importance of mangrove forest productivity in the function of the coastal ecosystem of Jakarta Bay cannot be ignored. A lot of development activities have negatively affected this area. The balance between economic gain and environment social loss should be weighted in favor of the longer – term objectives so that establishment of sustainable resources development will not be ignored. Attention should also be paid to the impact of coastal ecotourism development on the sustainability and conservancy of mangrove ecosystem. This research was conducted from September to November 2001 at Muara Angke of North Jakarta in Jakarta Bay. This research aimed to:

(1) examine the environmental suitability of mangrove ecosystem and coastal area for ecotourism development,
(2) obtain the optimum plans for the associated enterprise in relation to variables and parameters which relate the potential use of physical, economic and institutional restraints while considering the objectives of entrepreneur and policy planners,
(3) recommend the appropriate mangrove areas for ecotourism that would have the least effect for the coastal environment and the social activities of the local people.

Geographic Information System (GIS) method was used for evaluating the mangrove ecosystem suitability and Analytical Hierarchy Process approach was used for resolving the spatial/land use conflict to evaluate policy. The software program Expert Choice (3.1) is incorporated in the AHP methodology and enables the analyst to structure the hierarchy and resolve the problem using absolute measurement as appropriate.

The result showed that all along the Northern coast of what now is DKI Jakarta was originally mangrove forest ecosystem, complete with all richness of bio-diversity attained in it. However Indonesia should utilize institutional facility presently available as soon as possible, such as forestry agency, tourism agency, and other related institutions, which can act professionally and responsibly in the effort to develop coastal ecotourism better, especially mangrove forest ecosystem, so a coastal ecotourism project can be sustainable.

Keywords: policy analysis, mangrove ecosystem, coastal ecotourism, GIS, AHP

ABSTRAK

Ekosistem mangrove merupakan salah satu ekosistem penting di daerah tropika dan memiliki potensi ekonomi dan ekowisata yang besar. Beragam peranan ekosistem mangrove dalam ekowisata pesisir di Indonesia, pada saat ini diakui secara luas. Ekowisata adalah kegiatan pariwisata yang secara lingkungan (ekologis) berkesinambungan, yang terkait dengan pemahaman, penghargaan dan pelestarian lingkungan dan budaya.

Informasi mengenai ekosistem mangrove di Teluk Jakarta sebagian besar berkaitan dengan aspek flora dan fauna. Ekosistem mangrove di daerah ini mempunyai keragaman yang sangat terbatas. Pentingnya produktivitas ekosistem mangrove dalam fungsi-fungsi ekosistem pesisir di Teluk Jakarta tidak dapat diabaikan begitu saja. Banyak kegiatan pembangunan yang berdampak negatif pada wilayah tersebut. Suatu keseimbangan antara keuntungan ekonomis dan kerugian-kerugian sosial dan lingkungan haruslah diberi bobot yang patut demi tujuan-tujuan jangka panjang, sehingga terbentuknya pemanfaatan/pengembangan sumberdaya yang berkelanjutan tidaklah disia-siakan. Perhatian hendaknya diberikan terhadap dampak pengembangan ekowisata pesisir terhadap kelestarian ekosistem mangrove. Penelitian ini dilaksanakan dari bulan September sampai dengan November 2001 di daerah Muara Angke Jakarta Utara, Teluk Jakarta. Penelitian ini dimaksudkan untuk:

(1) mengkaji kesesuaian lingkungan ekosistem mangrove dan wilayah pesisir guna pengembangan ekowisata,
(2) memperoleh rencana optimal ekowisata, yang berhubungan dengan variabel (peubah) dan parameter yang terkait dengan penggunaan potensi dari kendala fisik, ekonomi dan kelembagaan, dengan mempertimbangkan sasaran yang ingin diraih oleh pengusaha dan perencana kebijakan,
(3) merekomendasikan daerah-daerah mangrove yang sesuai untuk ekowisata yang akan memiliki/mendapat dampak terkecil terhadap lingkungan pesisir dan kegiatan-kegiatan sosial penduduk setempat.

Sistem Informasi Geografis (SIG) dalam evaluasi kesesuaian ekosistem mangrove, dan Proses Hirarki Analitik (PHA) diterapkan dalam mencari penyelesaian konflik pemanfaatan ruang/lahan. Piranti lunak Expert Choice versi 3.1 digunakan dalam pengerjaan PHA (Proses Hirarki Analitik) dan memungkinkan penganalisa dalam strukturisasi hirarki dan memecahkan masalah dengan memakai penilaian mutlak bilamana diperlukan.

Sepanjang pantai utara DKI Jakarta pada mulanya merupakan ekosistem hutan mangrove dengan kekayaan keanekaragaman hayati. Bagaimanapun Indonesia sebaiknya memanfaatkan fasilitas kelembagaan yang tersedia sekarang, misalnya pihak kehutanan, agen-agen pariwisata dan lembaga terkait lainnya, yang dapat bertindak secara profesional dan bertanggung jawab dalam upaya mengembangkan ekowisata pesisir yang lebih baik, khususnya dalam hal ekosistem mangrove, sehingga program ekowisata pesisir tersebut dapat berkesinambungan.
Kata kunci: analisis kebijakan, ekosistem mangrove, ekowisata pesisir, SIG, PHA.

INTRODUCTION

Background

Mangroves live in community and roles in maintaining estuaries and shoreline and also become as habitat for various kind of animals. The tropical mangrove ecosystem is forest influenced by tides over the wide area about 180.000 km^2 (Spalding et al, 1997). Mangrove is existing around mouth of the great rivers and bay area and found in tropical countries which have high annual rainfall. Mangrove forest is primary component of coastal ecosystem and promoting land accretion, fixation of mud banks, dissipation of winds, tidal and wave energy.

Indonesia's mangrove forests are supposed to be the world's largest and described as wood sources in coastal area (coastal woodland).

Ecologically mangroves are important in maintaining and building the soil, as a reservoir in the tertiary assimilation of waste, and in the global cycle of carbon dioxide, nitrogen, and sulphur. The protection against cyclones are a "free" benefit. Yet hidden benefits from mangroves, especially in marginal areas, may even be more important than the obvious ones. They play a significant role in coastal stabilisation, but environmentalists here say their area has been cut in half by decades of export-oriented aquaculture. This kind of development has been encouraged by international financial institutions. The World Bank and other international donors, according to studies being undertaken by environmental groups here, for example, have often financed shrimp cultivation.

Tourism that consists in traveling to relatively undisturbed or uncontaminated natural areas with the specific objective of studying, admiring, and enjoying the scenery and its wild plants and animals, as well as any existing cultural manifestations (both past and present) found in these areas. Ecotourism is ecologically sustainable tourism that fosters environmental and cultural understanding.

The policy is fundamental requirement for the development and use of mangrove ecosystem marine resources and for special management of enclosed, such a policy establishes goals, objectives and priorities and lays down basic principles and criteria which provide guidance for the formulation of plans and programmes and a coastal ecotourism development strategy. The policy should outline a framework that identifies the financial, human, technical and institutional resources needed. The government has already enacted Environment Law No. 23/1997 to protect the mangrove ecosystem.

As mentioned above, the mangrove natural resources and environment are being deteriorated in the Jakarta area. A lot of development activities have negatively affected this area. If the situation continues, the environmental problems in Jakarta will become more severe. Such harmful activities require the sufficient planning and management to avoid conflicts and maintain the environmental quality, scenery and scientific value. However, this is not possible without ecological knowledge and adequate techniques that are available for mangrove management. Therefore, using Geographic Information System (GIS) techniques are useful tools to support a multi-sector resource planning and sustainable management for the Jakarta Bay.

Statement of the Problem

The main problem for mangrove forests in Indonesia is their degradation by conversion to fish or shrimp farms, known locally as tambak. Mangrove forests are also over-exploited for firewood, house construction, and making fishery tools. As we all know, the mangrove forest is a unique ecosystem that is very sensitive to disturbance; yet it is also a potential natural resource.

The government of Indonesia, through regional forestry officials, has attempted some conservation and rehabilitation efforts, but with success as low as 15 to 40%. The reasons for such low success rates include such factors as:

(1) inadequate control after replanting,
(2) poor quality of seed,
(3) site unsuitable for species planted,
(4) lack of community involvement.

The first three factors are not very serious; technical problems can be easily solved. However, the last factor is outside the control of the rehabilitation program implementers.

Mangrove considered as primary resources where huge communities depend on mangrove forest. In Indonesia threatening factors which influenced the mangrove are urban development, mangrove conversion, overexploitation, and oil spill. Combination between the ecologically protection and economically protection are the most important factor for these resources management. Highly damaged mangrove ecosystems need accurate control. An inventory for the resources accurately is much needed for more intensive management. Participation from local community to management and conserve the mangrove ecosystem will be helpful.

Objective of the Study

The objectives are:

1. To examine the environmental suitability of mangrove ecosystem and coastal area for ecotourism development,
2. To obtain the optimum plans for the associated enterprise in relation to variables and parameters which relate the potential use of physical, economic and institutional restraints while considering the objectives of entrepreneur and policy planners,
3. To recommend the appropriate mangrove areas for ecotourism that would have the least effect for the coastal environment and the social activities of the local people.

RESEARCH METHODS

Approach

Based on characteristic and dynamics of marine and coastal zones and development problems as well as government policy on marine sectors, then in order to reach optimum and sustainable development of coastal ecotourism, seemingly only can be carried out through integrated management of mangrove ecosystem. Logically, this is proper – since if studied empirically, there was ecological relationship or functional connection between ecosystem existed in the coastal zones as well as between coastal zone with uplands area and the open sea. The diagram of Approach Framework can be read from Figure 1 as follows.

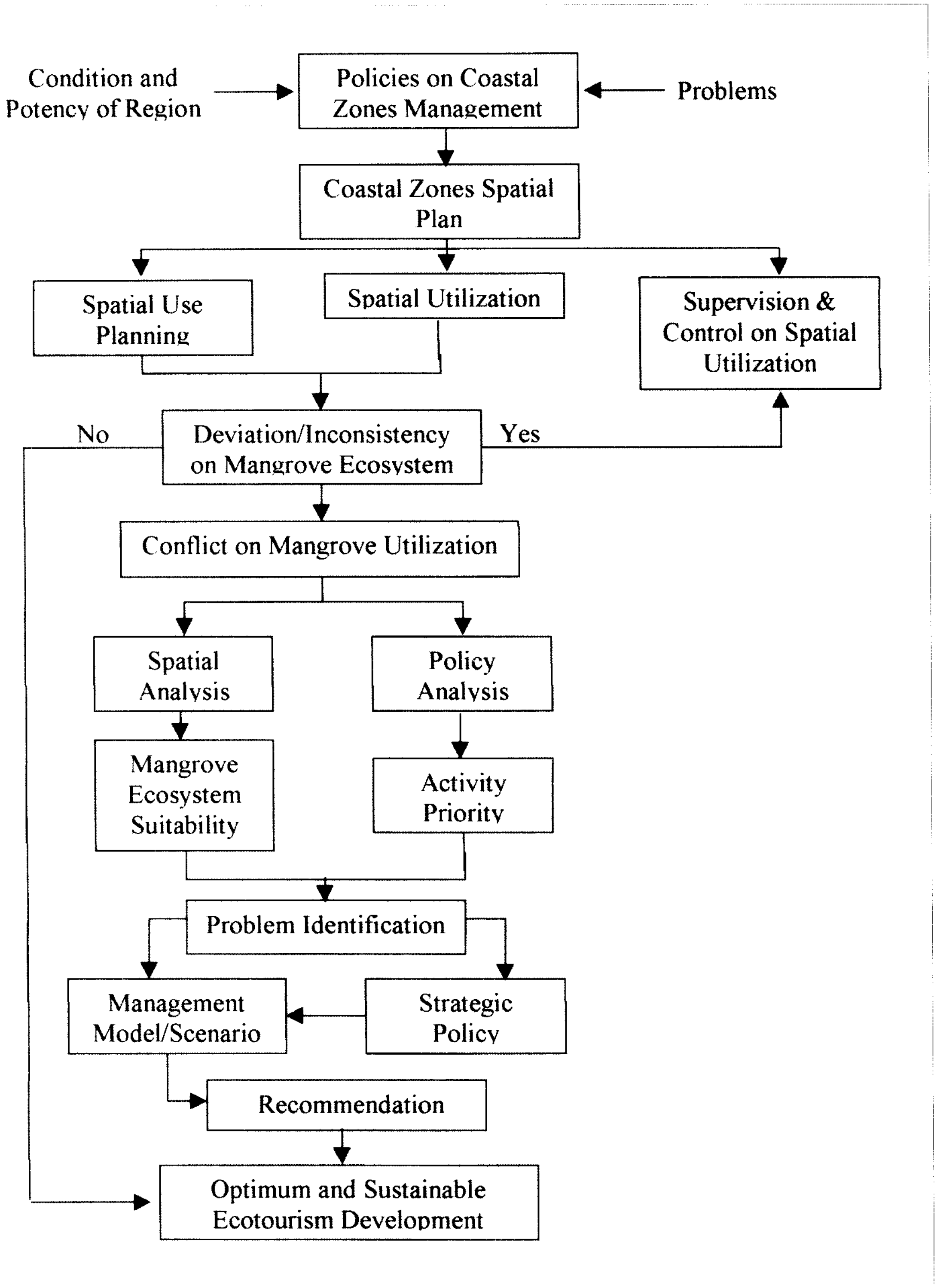

Figure 1. Approach schematic diagram

Location and Time of Research

The research was conducted from September to November 2001. Data analysis was done at Geographic Information System Laboratory of Coastal and Marine Resources Management Study Program. The location of the study area is in Muara Angke of North Jakarta/Municipality. The research location is presented in Figure 2.

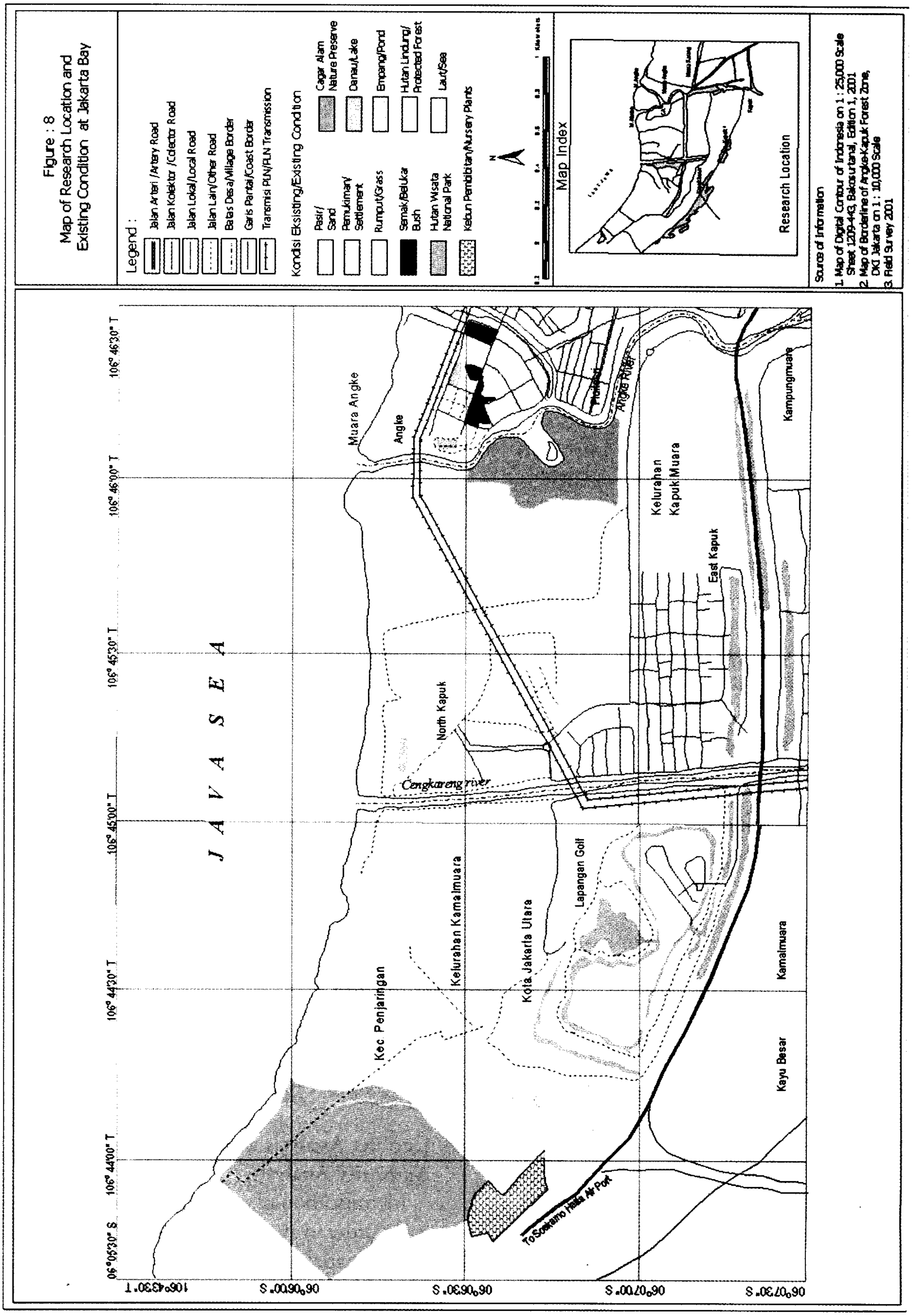

Figure 2. Map of research location and existing condition at Jakarta Bay

Data Collection

Data used in this research consisted of both primary and secondary data. The primary data was obtained directly from respondents through questionnaires and direct interview, direct observation on research object, in order to have/obtain the real view of field condition.

Secondary data was obtained from literature study at related institutions. From the authority was obtained laws and regulations related to mangrove forest management. This data is needed to study the regulation or law or ordinance that controlled the duty, function and authority of each related institution/agency as well as policies issued by regional and central government.

1. Digital Data Processing

Data used in the preparation of the map basically consisted of two categories: i.e. spatial data and alphanumeric data. The spatial data is the form of graphical chart whereas alphanumeric data is in table format. The spatial data used originated from topographical map as the basic map, as well as thematic charts (e.g. land use map, inclination map, elevation map, drainage, effective depth of soil, soil maps and water availability map, etc).

2. Method for Respondent Selection

The selection of respondent was carried out through purposive sampling, i.e. intentional selection by considering the particular respondent as a land user (stakeholders). Respondents consisted of government, private sector and community groups, which affect the policy determination of suitability of mangrove ecosystem forest use either directly or indirectly in Jakarta Bay.

The selection of respondent in the AHP method is based on interviews activity using prepared questionnaires for 20 (twenty) respondents, consisted of officers working with the related government officer/institutions or respondents that have specific knowledge (expert), directly involved respondent or respondent that was considered as understanding the problem and has the ability to influence mangrove ecosystem of coastal zone of Muara Angke.

These respondents were, among others Bappeda DKI Jakarta, Dinas Perikanan DKI Jakarta, BPN, Industrial and Trading Agency, Forestry, Civil Works and Amenities, Tourism Agency, Enterpreneur, Fishery pond operators and community leaders.

Data Analysis

1. Geographical Information System Method Approach

Spatial utilization of coastal zones was conducted based on developed principles, hence the spatial utilization has clear context in sustainable development terms. The principles are in space utilization that was used in conducting/determining the zoning of an area according to the interest of various parties (stakeholders).

2. Preparing the Hierarchy Structure (Preparing the Pairwise Comparison Matrix and doing the Comparison)

The pairwise comparison matrix reflected the relative contribution or the effect of each element on each objective/criteria, are level or above it. Comparison is conducted based on judgment by decision- maker by evaluating the importance level of one element against other element. The determination of each hierarchy or opinion level is carried out by pairwise comparison. The pairwise comparison technique used in AHP is based on judgment or opinion of decision maker / expert or non-expert but involved and understood the problems, selected as the respondent through direct interview and by comparing the importance of one element against the other.

Evaluation is conducted through weighting for each component of the pairwise comparison, starting from the highest level down to the lowest level. Weighting is based on the judgment or opinion of decision -makers or experts, by giving comparison score between 1 to 9 (Saaty, 1993).

3. Conflict Analysis and Function and Authority Analysis

Identification of conflict is carried out at this stage, in order to ascertain the causal factors. Looking at the spatial use conflict by comparing the factual condition and the spatial use plan, the function and authority analysis is conducted by doing the studies on law product and regulation related with mangrove management and the function and duties of the involved institutions.

The research uses the AHP approach in the planning and GIS phases. Specific requirements and sequences are needed to analyze the situation by AHP approach, as follows:

a. Defining the Problems and the Expected Solution
   AHP approach is intended to solve problems as well as finding the expected solution, i.e. deriving an optimum scenario model, the involved aspect/problems, executor as well as preparing a policy sequence that will be conducted.
b. Comparison Matrix for Hierarchy
   In this research, a hierarchy comparison matrix was prepared for involved party or stakeholders who play dominant roles or has some priority role in the management.

GENERAL DESCRIPTION OF THE AREA

Background

Muara Angke is the remaining mangrove forest left in DKI Jakarta often forgotten by most people. The existence of Muara Angke mangrove forest helps community, especially citizen of Jakarta and its surrounding location to see and understand mangrove trees, complete with all wildlife living there. In addition, its location is not far from activity centers (shopping centers and tourism, i.e. fish landing and marketing facility), close to International Airport as well as bordering the classy housing estate; all within easy reach by people.

Muara Angke area, in the form of coastal mangrove forest is a forest zone at the North coastal area of DKI Jakarta. It has special characteristics as life supporting system. In this case, it has functions as a buffer zone, presenting the intrusion of saline water in land areas; preventing sea wave abrasion with its physical protection capacity; as fishery habitat as well as various kind of birds and wildlife, also as education area and as open green zone for the big city which contributes precious oxygen as well as natural recreation areas.

Due to the unique condition of mangroves, the biological diversity contained in it and its strategic location had made Muara Angke highly suitable to be developed for limited ecotourism resort. The availability of Muara Angke as tourism resort with emphasis an education is perceived positively and enthusiastically by the community. This can be proven by the record of community visiting the area as well as the unrecorded visitors, especially during the weeks ends.

Economics

Neither kelurahan had significant difference in the composition of occupation or livelihood. However, for the farmer/fishermen sector, the largest domination occurred in Kelurahan Kapuk Muara. The labour/worker sector at both kelurahans are significantly greater than other kind of occupation.

Culture

Most of the population are Moslem. At Kelurahan Kanal Muara and Kelurahan Kapuk Muara the moslem population is respectively 95.2 % and 82.8 %.

Spatial Use of Land

The land utilization at Kelurahan Kapuk Muara are 23.2 % (Agriculture), 50.0 % (Industrial), 53.8 % (housing settlement), 3.1 % (Offices), 0.6 % (Trading), and 14.3 % for others. The Kelurahan Kapuk Muara is divided into 52.0 % (Agriculture), 43.87 % (Officer, housing and trading) and other (4.13 %).

RESULTS AND DISCUSSION

The Interest of Surrounding Community

Muara Angke belongs to one of estuary zones that is quite big and busy. The surrounding estuarine areas are densely populated with all social classes, from the low economic income up to the richest community.

A community has lived around Muara Angke zones for years, along the banks of Angke River, who understand and are concerned for the existence of the conservation area. Their concern was showed by their participation in rehabilitation (mangrove replanting) programs, not taking or cutting any wood from the area, no conducting bird shooting, and catching fish or other wildlife inside the area. Following conversations with local community leaders, it can be deduced that the community didn't have any objection to appropriate area development, such as site development for tourism.

Supply (Potency) and Demand Analysis (Demand on Conservation Function of Muara Angke)

Supply (Potency) Analysis of Muara Angke

Studies on Muara Angke and the surrounding areas looked at the zone's potency in an effort to meet the demand, expected in the objective of the management. This is classified into two groups, as follows:

A. The Internal Potency of the Muara Angke

A couple of parameters showed that Muara Angke still deserve to be maintained conservation zone, such as:

1. Bio-diversity

The potency of flora diversity is based around 42 species, consisting of mangrove (*Rhizophora* sp., *Avicennia marina, Sonneratia caseolaris, Bruguiera gymnorrhiza, Nypa fructicans, Excoecaria agallocha* etc), coastal vegetation (*Terminallia catappa, Hibiscus tilliaceus, Casuarina equisetifolia* etc), swamp vegetation (*Eichornia crassipes, Andropogon nardus, Ipomea* sp etc), and dry land vegetation (*Calamus* sp., *Acacia auriculiformis, Imperata cylindrica* etc).

The fauna diversity (i.e. mammals) covered 54 individuals of long tailed monkeys (*Macaca fascicularis*), otter (*Aonix cinerea*), and rats. Reptiles were represented by 7 species (caymam, boa, slate colored snake, cobra, badut snake, ring snake and green snake). There were 11 species of fish (gabus, sepat jawa, sepat rawa, betok, gapi, keting, kipper, pepetek, julung-julung, kepala timah and nila).

2. The Naturalness of Ecosystem

When the Dutch Government issued the decree, the status of forest at Muara Angke as a sanctuary zone, the delta of Angke River consisted of mangrove forest dominated by paddy vegetation (*Sonneratia caseolaris*). Development and subsequent effects of surrounding environment had caused environmental changes on the forest ecosystem of Muara Angke.

3. Recreation Activity (Demand Analysis) in Muara Angke

(a) General tower
(b) Photography hunting
(c) Bird watching
(d) Hiking and walk inside the mangrove forest (board walk)
(e) Fishing
(f) Introduction to the culture of Muara Angke community

B. External Potency of Muara Angke Area

1. Dunia Fantasi (Dufan) Ancol
2. Marine Tourism (Ocean Harbor, TPI Kapuk, Bivalve Aquaculture, Rambut Island, Untung Jawa Island, Pari Island Resort and Bidadari Island Resort)
3. Shopping Center (Mangga Dua, Glodok, Mega Mall Pluit, PIK Mall)
4. Sport Facility (PIK Golf Course)
5. Protected Forest at Muara Angke, Toursim Forest, Mangrove Nursery

Government Policy

The government policy in relation to the preservation of the conservation area and Muara Angke site can be studied from a couple of policies, either at National, sector or regional levels. At the National and Sectoral levels (i.e. the form of law, regulation (PP & Keppres)), the commitment of GoI (Government of Indonesia) to maintain and preserve the conservation areas is still high. This is reflected in law no. 24/1992 (spatial use), law no. 23/1997 (Management of Environment), and law no. 41/1999 (Forestry). Law no. 5/1990 (The Conservation of Natural Biodiversity and its ecosystem), law no. 22/1999 (Regional Governance), as well as Keppres (Presidential Decree) no. 32/1990 (The Management of Protected Zones) and PP (Government Regulation) no. 28/1985 (Forest Protection) PP no. 20/1990 (Standard of Water Quality) etc.

The policy of DKI Jakarta government (RUTR 1995 – 2010) had included the preservation of Muara Angke area as had been stated in the Development Strategy of DKI Jakarta on WKP Pantura: the main attention was directed toward managerial effort to assure the preservation of protection functions along the Pantura, before and after the reclamation. The direction of spatial use pattern of protected zones stated that the management of protected zones is for the improvement of protection function for the region as well as the protection of air quality and microclimate.

The Management of Muara Angke Wildlife Sanctuary

Technically, the management of Muara Angke is under the working area of Natural Resources Conservation Agency, of Provincial Office of Ministry for Forest and Crop Estate of DKI Jakarta. In conducting the management, the conservation site is directly under the coordination of Natural Resources Conservation Agency (BKSDA), i.e. under the conservation section. Within the conservation section there is the subsection for Eastern Jakarta Area, which directly conducts the management and control on the site, helped by administration personals, forest wardens, and functional officers for exclusion services. In order to conduct daily operation, BKSDA assigned one field officer stationed at the conservation site with the main job to control and guard the site.

Conflict on Space Utilization

Space utilization for certain development activity constitutes highly important decision making, especially if related with environment, social, economic, living environment and technology factors. The reasons were that determining what is carried out by people on the land where people are inseparable part of it is a demanding task. Ecotourism pattern in a region is a containment of human activity according to the level of technology, physical condition, kind of works, magnitude and the interest of people living in that region.

Indonesia has laws and regulations concerning land tenure, rights and utilization. However, during the implementation deviations always occur, e.g. deviating from the valid RUTR (Spatial Use Plan). Therefore, it is potentially easy to induce the development of spatial use conflict, such as that happened in: (1) Jakarta Bay i.e. conflict on spatial use plan between industrial and mangrove ecosystem purposes. The spatial use plan assigned the zone for mangrove fishery, while the results on land suitability analysis, both location are suitable for mangrove ecosystem. (2) Muara Angke, i.e. conflict between industrial, mangrove ecosystem and settlement purposes, where these three purposes cannot exist together simultaneously, because each activity imposed negative impact to the other.

Conflict between Industry, Mangrove Ecosystem, Natural Conservation and Protection Area, and Research and Natural Laboratory

AHP procedure is carried out on conflict between industry and mangrove ecosystem at Jakarta Bay. Based on judgment from stakeholders covering the government, private sectors and community, the Consistency Ratio (CR) was obtained, ranging between 0.01 to 0.08, i.e. still under CR = 0.10. Therefore, it was concluded that the stakeholders were consistent in providing the weighting score with small deviation level.

a). Combined Opinion in Ecotourism Development Priority

Results of analysis on combined opinion in ecotourism development priority determination for each stakeholder involved in the present conflict, are shown in Table 1, 2, 3 as follows:

Table 1. Results of Analysis or Group/Combined Opinion on Priority Determination for Each Stakeholder.

Policy for Ecotourism	Stakeholders					
	Government		Private Sectors		Community	
	Weight	Priority	Weight	Priority	Weight	Priority
Industrial	0.131	3	0.126	3	0.126	3
Mangrove Ecosystem	0.543	1	0.571	1	0.576	1
Natural Conservation	0.202	2	0.186	2	0.180	2
Research & Laboratory	0.125	4	0.117	4	0.118	4

The results of analysis presented in the Table 1, 2, and 3 on priority determination activity according to government's perception, was the first priority went for mangrove ecosystem with weighting score = 0.543 and if looked at from the upper hierarchy (level 3), then the highest weight factor was area availability with weighting score = 0.225, and pollution with weighting score = 0.161. Therefore, the government's perception in the first priority determination was for mangrove ecosystem protection purposes based on environment and social consideration.

Table 2. Results of Hierarchy Level –3 Analysis on Opinion Against Influential Factors in Priority Determination for Each Stakeholder.

Criteria For Ecotourism	Stakeholders					
	Government		Private Sectors		Community	
	Weight	Priority	Weight	Priority	Weight	Priority
Income	0.032	8	0.035	7	0.036	8
Capital	0.025	11	0.013	11	0.029	9
Resource Exploitation	0.020	12	0.006	12	0.008	12
Fisherman	0.029	9	0.017	10	0.023	10
Pollution	0.161	2	0.074	5	0.229	2
Quality Degradation	0.129	3	0.250	2	0.115	3
Area Availability	0.225	1	0.285	1	0.293	1
Custom & Tradition	0.061	7	0.151	3	0.051	7
Competition	0.097	5	0.026	8	0.018	11
Job Opportunity	0.092	6	0.080	4	0.081	4
Introduction & New Technology	0.102	4	0.024	9	0.065	5
Process Adoption	0.027	10	0.041	6	0.052	6

Table 3. Results on Opinion Analysis on Aspect Consideration in Priority Determination for Each Stakeholder.

Aspect for Ecotourism	Stakeholders					
	Government		Private Sectors		Community	
	Weight	Priority	Weight	Priority	Weight	Priority
Industry	0.106	4	0.071	3	0.096	3
Environment	0.516	1	0.609	1	0.637	1
Social	0.249	2	0.256	2	0.150	2
Technology	0.129	3	0.064	4	0.117	4

Based on the private sector's perception, the first priority went for mangrove ecosystem with weighting score = 0.571, which is looked from the upper level 3 then the highest weighting factor was the area availability with weighting score = 0.285 and quality degradation with weighting score = 0.250. Therefore, the perception of private sector in determining the first priority was also for mangrove ecosystem protection purposes, based on social aspects and environmental considerations.

The perception of community put the first priority for mangrove ecosystem with weighting score = 0.576. Looked from one level up hierarchy (level 3), the highest weighting factor was also area availability practiced for generations with weighting score = 0.293, and pollution with weighting score = 0.229. Hence, the community perception in determination of first priority was for mangrove ecosystem protection based on social-environmental consideration.

b).The Structure of First and Second Hierarchy

The results on research on consideration aspect and results of analysis on affecting factors against the ecotourism development priority determination were presented in Tables 4, 5, and 6.

In Tables 4, 5, and 6, it was showed that ecotourism development for mangrove ecosystem purposes then the environment aspect consideration was the most dominating with weighting score = 0.561 and factors which highly influencing these aspects in relation with land utilization for mangrove ecosystem in subsequent order was area availability as first priority with weighting score =0.252. The existence of mangrove ecosystem in this region can increase the original regional as well as local community's earnings. The second priority was pollution with weighting score = 0.164. There are a couple of matters that need further study: At first, it was expected that the ecotourism development expected will be able to employ the local work force. In reality, the job opportunity employment fell into the fourth priority. Due to fact that the local workforce lacked the needed skill, many of the employed are skilled labor from other regions.

From the results from the union of all respondents opinion analysis described in Tables 4, 5, and 6 for mangrove ecosystem issues, it can be concluded that the environment consideration hold first priority with weighting score = 0.561. This was influenced heavily by area availability factor. There was passed from one generation to the next (weighting score = 0.252. This can be explained by fact that most of the land utilized for mangrove ecosystem is inherited property from their ancestors. The second priority and the third priority was community's pollution and quality degradation with weighting score =0.164 and weighting score = 0.146. The fourth priority was job opportunity absorption with weighting score = 0.087. The reason was that local workforce has the skills and expertise for that purpose.

c).The Third and Fourth Hierarchy Structure

Based on the results of hierarchy analysis on the union of all respondents opinion in ecotourism development conflict between industry, mangrove ecosystem, natural conservation and protection area, and research and natural laboratory at Muara Angke placed more importance on mangrove ecosystem purpose with weighting score =0.555 than consideration on environmental aspect with weighting score = 0.561. The second aspect was social aspect with weighting score = 0.226 and the third aspect, which is also influential, was technology aspect. i.e.: Introduction to new technology and process adoption. This shows that mangrove ecosystem development in study area which has pollution potency must have waste treatment management (either solid, liquid or gaseous waste) before discharging to river or sea.

The results of hierarchy analysis, on ecotourism development priority determination in spatial use of coastal zone are presented in Figure 2.

Policy Analysis

In relation to the results of analysis on ecotourism development conflict in spatial use of coastal zone that occurred in Jakarta Bay, i.e. conflict between industrial and mangrove ecosystem purposes, then based on hierarchy analysis result it can be said that the location priority was for mangrove ecosystem purposes. Whereas the land suitability evaluation stated that the location was actually suitable for both intentions. Factors that aroused the conflict on the location were due to land utilization that not in accordance with direction stated in the spatial use plan for land being suitable for mangrove ecosystem construction. Based on results of hierarchy analysis and evaluation as well as considering the direction stated in spatial use plan 2000 that was not suitable anymore with industry development situation, then the determination of ecotourism development for mangrove ecosystem purposes can be recommended as the foundation for decision making in determining the policy to solve the conflict occurring in Muara Angke in Jakarta Bay.

A Similar finding was made for conflict in ecotourism development in spatial use of coastal zone that occurred at Muara Angke i.e. conflict between industry, mangrove ecosystem, natural conservation and protection area, and research and natural laboratory, based on results of hierarchy-2 analysis. The priority of the location went for first priority for mangrove ecosystem and the second priority for natural conservation and protection area. Because both activity has the relatively same level of interest for the Government, private sector and community. i.e. the differences in weighting score were small. The next priority went for industry and then research.

However, based on the results of land suitability evaluation, that particular location was highly suitable for mangrove ecosystem and suitable for natural conservation and protection area. Factors that incited the conflict in that location are due to

Table 4. The Result of the Union of All Respondents Opinion Analysis on Aspect Consideration of Coastal Ecotourism Development Priority Determination.

ASPECTS	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	TOTAL	WEIGHT	PRIORITY
Economic	0.078	0.078	0.095	0.125	0.160	0.056	0.149	0.074	0.068	0.096	0.149	0.042	1.170	0.098	4
Environment	0.341	0.522	0.560	0.375	0.636	0.525	0.645	0.592	0.626	0.613	0.645	0.652	6.732	0.561	1
Social	0.444	0.200	0.249	0.375	0.084	0.279	0.115	0.288	0.223	0.123	0.115	0.216	2.711	0.226	2
Technology	0.137	0.200	0.095	0.125	0.119	0.139	0.091	0.045	0.083	0.169	0.091	0.090	1.384	0.115	3

Table 5. The Result of the Union of All Respondents for Hierarchy Level-2 Analysis on Opinion Against Influential Factors in Coastal Ecotourism Development Priority Determination

FACTOR/CRITERIA	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	TOTAL	WEIGHT	PRIORITY
Income	0.025	0.010	0.037	0.011	0.054	0.004	0.081	0.043	0.027	0.048	0.040	0.021	0.401	0.033	9
Capital	0.022	0.010	0.026	0.076	0.018	0.016	0.007	0.016	0.009	0.008	0.076	0.004	0.288	0.024	11
Resources Exploitation	0.006	0.029	0.024	0.029	0.028	0.008	0.015	0.007	0.005	0.009	0.011	0.004	0.689	0.015	12
Fisherman	0.025	0.029	0.008	0.010	0.059	0.029	0.046	0.008	0.026	0.031	0.023	0.014	0.308	0.026	10
Pollution	0.114	0.104	0.112	0.161	0.289	0.256	0.092	0.066	0.082	0.204	0.411	0.072	1.963	0.164	2
Quality Degradation	0.114	0.104	0.336	0.161	0.058	0.041	0.092	0.066	0.434	0.204	0.068	0.072	1.750	0.146	3
Area Availability	0.114	0.313	0.112	0.054	0.289	0.229	0.461	0.461	0.109	0.204	0.167	0.507	3.020	0.252	1
Custom & Tradition	0.063	0.120	0.036	0.125	0.010	0.025	0.045	0.138	0.163	0.078	0.049	0.029	0.881	0.073	6
Competition	0.190	0.040	0.107	0.125	0.034	0.127	0.059	0.033	0.018	0.013	0.016	0.026	0.788	0.066	7
Job Opportunity	0.190	0.040	0.107	0.125	0.041	0.127	0.011	0.117	0.042	0.032	0.049	0.162	1.043	0.087	4
Introduction Technology	0.103	0.150	0.072	0.109	0.089	0.116	0.076	0.038	0.010	0.148	0.023	0.023	0.957	0.080	5
Process Adoption	0.034	0.050	0.024	0.016	0.030	0.023	0.015	0.008	0.073	0.021	0.068	0.068	0.430	0.036	8

Table 6. The Result of the Union of All Respondents Opinion Analysis on Priority Consideration of Coastal Ecotourism Development Priority Determination

POLICY	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	TOTAL	WEIGHT	PRIORITY
Industry	0.126	0.123	0.148	0.138	0.140	0.118	0.122	0.131	0.121	0.121	0.133	0.125	1.546	0.129	3
Mangrove Ecosystem	0.577	0.543	0.508	0.538	0.566	0.532	0.534	0.570	0.572	0.582	0.572	0.571	6.665	0.555	1
Conservation & Protection	0.181	0.206	0.215	0.197	0.176	0.211	0.231	0.181	0.191	0.177	0.179	0.185	2.330	0.194	2
Research	0.116	0.129	0.129	0.127	0.118	0.139	0.114	0.118	0.116	0.120	0.116	0.119	1.461	0.122	4

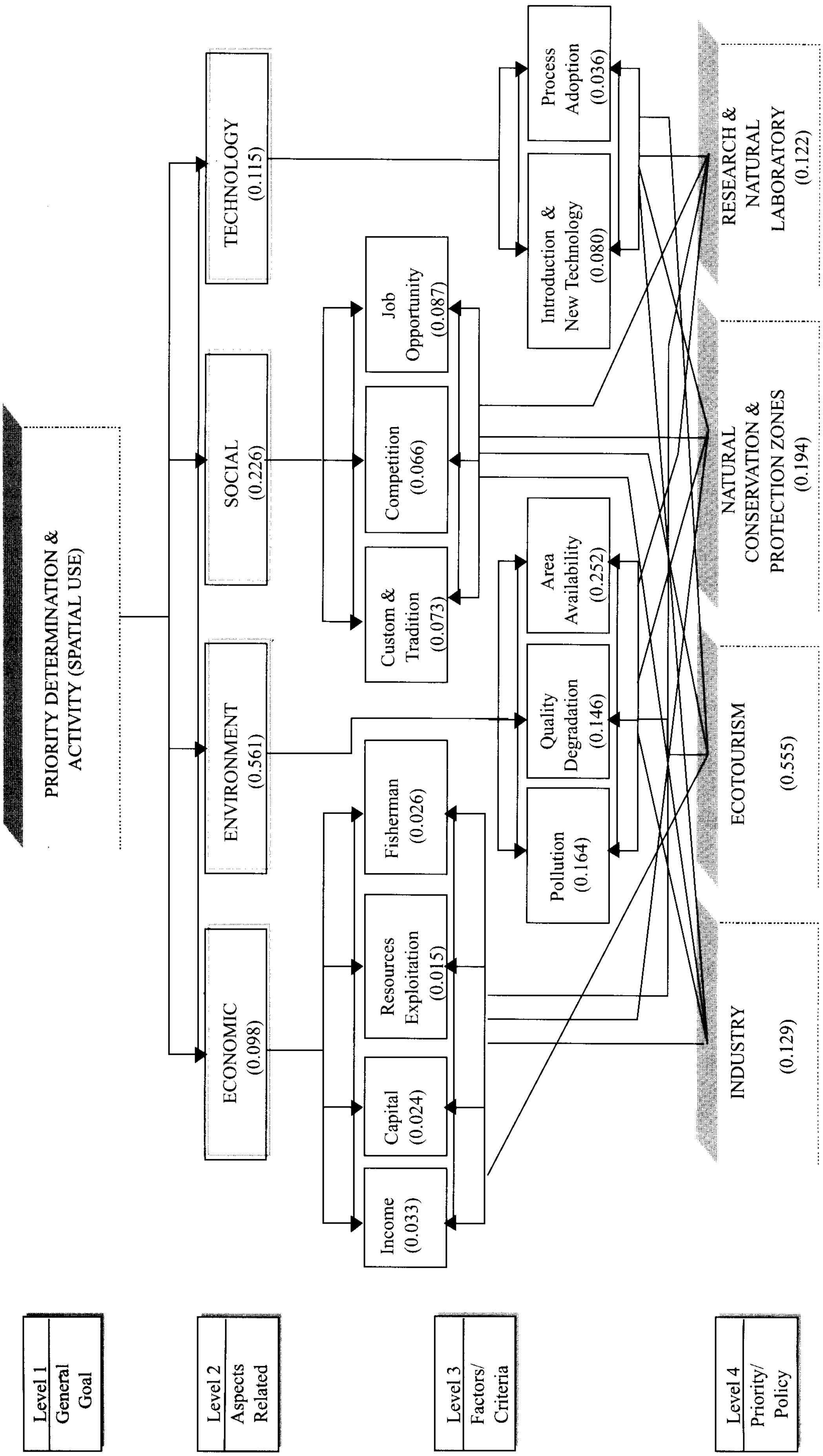

Figure 2. Result of Analytical Hierarchy Process

land utilization for industry, which was not following the direction mentioned in the spatial use plan. Land was therefore allocated for fishponds and housing/ settlement in anticipation of the regional development direction.

Based on the result of research, subsequent discussion and field study conducted, it can be concluded that the optimal maintained forest area was 327.70 Ha. The assignment and function of Jakarta Bay Forest zone is as follows:

- Protected Forest = 44.76 Ha
- Tourism Forest = 99.82 Ha
- Muara Angke Natural Sanctuary = 25.02 Ha
- Forest for Special Intention (LTDI)
  Forestry Nursery = 10.51 Ha
  PLN's Transmission Path = 23.07 Ha
  Cengkareng Drain = 28.93 Ha
- Toll Road and Green Belt = 95.50 Ha

CONCLUSION AND RECOMMENDATION

Conclusion

The ecosystem of mangrove forest at Muara Angke is an integral part of Jakarta Bay and the surrounding environment. Almost all activity, development, social, economic, cultural and especially physical development activity is related closely with the bay's environment. Therefore, the mangrove forest resources of the bay function as a vital component of the natural environmental balance and needs to be guarded and maintained from degradation and destruction.

All along the northern coast of what now is DKI Jakarta was originally mangrove forest ecosystem, complete with all richness of bio diversity contained in it. However, nowadays, the remaining forested areas can only can be found at the Muara Angke forest zone (327.70 Ha). Forests where the condition is reasonably good and the management status still provide quite high protection values are the protected forest (50.8 Ha) and the Muara Angke Sanctuary (25.02 Ha).

Each zone of Muara Angke has its own potency for ecotourism, such as:

- The unique and beautiful of scenery at Jakarta Bay
- The diversity of vegetation wildlife and mangrove waters biota
- The specific features of local community's culture.

In addition, the position of DKI Jakarta as the capital of Indonesia and the gateway for all state guests, then the existence of Muara Angke forest zones, which also represent the original mangrove ecosystem in DKI Jakarta, the forested areas are of Muara Angke is highly important to be maintained and preserved for future generation to come and for National pride.

Based on the above potency, then the opportunity to develop ecotourism in this mangrove forest is very high. Ecotourism is one form of recreation, which relies heavily on the beauty and richness of nature. Based on spatial allocation, ecotourism activities which can be adopted or accommodated are divided into two parts, i.e.:

1. Scientific tour activity, this is one kind of ecotourism activities which was intended to provided or to improve knowledge on the whole aspect of mangrove in the Muara Angke, consisting of :
   a) Introduction to the mangrove vegetation, one kind of ecotourism which will provided scientific information to the visitor on:
      - Habitat of mangrove vegetation
      - Observation on the structure of mangrove vegetation
      - Species identification of mangrove vegetation

   b) Introduction to wild life (learning to know the wild life) is a challenging activity and requires patience, because wild life is mobile or moving around.

   c) Research is a useful and beneficial activity for education as well as the development of science. The activity consisted of works such as research related with mangrove ecosystem and watershed ecosystem management; the re search work can be suspected on perfected zones and mangrove waters.
2. Recreational activity, with the purpose to obtain enjoyment and providing first hand experience to the visitor; this consist of :
   - General tour/sight seeing
   - Photography hunting
   - Bird watching

- Board walk experience
- Fishing sports
- Cultural introduction to the local community

All the above works can be implemented on both mangrove forest ecotourism zones and mangrove waters ecotourism zones. If these ideas are implemented, they will need an ecotourism development plan which is based on the principal of environmental conservation. The physical development concept is environmentally friendly planning and construction, with basic facility construction that will ensure the safety and comfort of visitors, e.g. protection against weather, good air circulation, clean etc.

Another opportunity that will be able to accommodate special scientific activity, e.g. research and development studies, is the protected mangrove zones and protected water zones. More common scientific research (i.e. introduction or identification of vegetation and wild life) and recreational activities can be conducted in the mangrove ecotourism zones and mangrove waters ecotourism zones.

The less productive fishery pond can be reclaimed and converted into community settlement; whereas the productive fish ponds and located close to mangrove zones can be maintained and developed as a tourism attraction of silvo-fishery concept.

The perception of government and private sectors on coastal zone spatial use at DKI Jakarta, was focused more or mangrove ecosystem based on environment consideration. Whereas the perception of the community was dominant on fishery activity by sociological aspect consideration, i.e. the fish ponds business had been traditionally carried out for generations.

Considering the results from ecotourism development, the results from Analytical Hierarchy Process and the available Spatial Use Plan, as well as present condition of regional development then in order to solve the conflict at the Jakarta Bay. It was recommended as mangrove forest zones, because the surrounding industry was not productive. Therefore, the land can be converted to forest.

Recommendation

In order to recover the lost environmental function due to reduction of conservation zones area, mangroves replanting activity should be carried out. Although the surface area of the replacement was not as vast as the original zones, at least this effort can improve the environmental quality of the surroundings.

Based on results of hierarchy analysis and evaluation as well as considering the direction stated in the spatial use plan 2000, then the decision to utilize the land for mangrove and fishery ponds can be recommended as the foundation for decision making in determining the policy for solving the conflict occurred at Muara Angke, this also matches results of the land suitability analysis.

This research can be extended further, by in depth research on economic values which can be contributed by mangrove forest ecosystem, either direct economic values (from revenue from entry payment to the recreational forest) or the indirect value (the contributed ecological values).

Government of Indonesia should ascertain the laws, especially spatial use law(s) which is clear, bounding and has powerful impact, hence any land that already has clear assignment can/not be replaced or its function change.

A revision should be conducted on the spatial use plan because the present spatial use plan was irrelevant or incompetent in terms of the present condition and regional development. Communities that suffered impact from the development occurred on the area should be relocated to a much better location.

Socialization should be carried out to help the community in the preparation effort for increasing industrial activity, especially with the present trend toward global economic development for the New Indonesia Era.

REFERENCES

Aksornkoe, S., 1995. Ecology and Biodiversity of Mangroves. Proceeding of Ecology and Management of Mangrove Reforestation and Regeneration in East and Southeast Asia. Thailand, 18 - 22 January: 20-36.

Quarto A, 2001. About the Mangrove Action Project. P.O. Box 1854 Port Angeles, WA 98362-0279 USA. Website: http://www.earthisland.org/map/index.htm

Anonym, 1997. Mangrove Forest. http://www.magrove-f.org/mangrove.htm

Anwar and Subiandono, 1997. Technical Guidelines of Mangrove Planting. Cooperation between Research and Development Center of Forest and Natural Conservation in Bogor and Surakarta, Indonesia.

Bengen, D.G., 1998. Metodologi Riset Sumberdaya Pesisir dan Lautan. Program Studi Pengelolaan Sumberdaya Pesisir dan Lautan, Pasca Sarjana, Institut Pertanian Bogor.

Bengen, D.G, 2001. Pedoman Teknis Pengenalan dan Pengelolaan Ekosistem Mangrove. Pusat Kajian Sumberdaya Pesisir dan Lautan, IPB Bogor.

BPP Teknologi, 1998. Remote Sensing and Geographic Information System, YearBook 97/98. Jakarta.

Butter, R. W., 1991. Toursim, Environment, and Sustainable Development Environmental Conservation, 18(3), 201-207.

Chrisman, N., 1997. Exploring Geographic Information System. John Wiley & Sons, University of Washington.

Clark, J., 1996. Coastal Zone Management Hand Book. CRC Lewis, New York.

Dahuri, R., 1991. An Approach to Coastal Resources Utilization: The Nature and Role of Sustainable Development in East Kalimantan Coastal Zone, Indonesia. Ph.D. Dissertation, Dalhousie University, Halifax, Canada.

Dahuri, R., J. Rais, S.P. Ginting, and M.J. Sitepu., 1996. Integrated Coastal and Marine Resource Management. Pradnya Paramita, Jakarta.

Eckert, R and R.H.Wish., 1988. The Price System and Resource Allocation. The Dryden, Chicago.FAO, 1982. Management and Utilisation of Mangrove in Asia and the Pasific. FAO Environment Paper 3, Rome, Italy.

FAO, 1993. Integrated Management of Coastal Zones. FAO Fisheries Technical Paper NR. 327, Rome, Italy.

FAO, 1994. Mangrove Forest Management Guidelines. FAO Forestry Paper No. 117, Rome, Italy.

Field, B. C., 1994. Environmental Economics: An Introduction. Mc Graw-Hill, USA.

Haryadi T., dan W. Wishnu, (1995). Konservasi Air tanah di Wilayah DKI Jakarta - Tangerang. Direktorat Geologi Tata Lingkungan, Bandung - Indonesia (unpublished).

Hehanussa, P. E., S. Hadiwisastra and S. Djoehanah 1975. Sedimentasi delta baru Cimanuk. Geol. Indon. 3 (1):21 - 35.

Hunt, L.J., 1999. Integrated Coastal Zone Planning and Management Manual. Vaughan International. Canora Asia Incoporated Group of Companies. Canada.

Kjerfe, B., 1990. Manual for Investigation of Hydrological Processes in Mangrove Ecosystem. UNESCO/UNDP Regional Project.

Martosubroto, P. and N. Naamin, 1978. Relationship between Tidal Forests (mangrove) and Commercial Shrimp Production in Indonesia. Marine Fisheries Research Institute, 18: 81-86.

Ministry for Environment, 1999. Agenda 21 Indonesia: National Strategy for Sustainable Development. Ministry for Environment/UNDP, Jakarta.

National Research Council, 1995. Science, Policy and the Coast: Improving Decision-Making, National Academy Press, Washington DC.

Saaty, T.L., 1993. Pengambilan Keputusan Bagi Para Pemimpin (Proses Hirarki Analitik untuk Pengambilan Keputusan dalam Situasi Kompleks). Terjemahan. PT. Pustaka Binawan Pressindo, Jakarta.

Spalding, M.D., F. Blasco and C.D. Field, 1997. World Mangrove Atlas. The International Society for Mangrove Ecosystem, Okinawa, Japan.