Proceedings
Technical Workshop
ASEAN-US Coastal Resources Management
Indonesia In-Country Project
7-9 March 1988
Sky Garden Hotel Semarang
Indonesia

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1.1. Opening Address by Dr. Aprilani Soegiarto Chairman of Working Group on Marine Sciences.

Cordial greetings were extended to all participants and distinguished guests, Dr. Chua Thia-Eng and Dr. Alan White, the Project Coordinator and Project Advisor, respectively.

Dr. Aprilani explained that ASEAN-US Coastal Resources Management Project is intended to improve CRM expertise in the ASEAN region by training personnel and involving researchers and government employees in pilot field projects. A second goal is to strengthen the collaborative work among the ASEAN countries involved in coastal resources management project.

Dr. Aprilani Soegiarto further noted that given the multidisciplinary background of the participants he hoped that the Workshop would allow sharing of information useful for management planning in a broad context. He also said it was time to complete research and more so the task of practical planning and to ask new questions in this context.

1.2. Key Notes by Dr. Purwito Martosubroto Chairman of National Steering Committee.

Dr. Purwito Martosubroto welcomed the participants to the Workshop and suggested that since Dr. Chua Thia-Eng and Dr. Alan White were attending the Workshop, English be used as the mean of communication in order to facilitate discussion.

Dr. Purwito Martosubroto explained the reason for choosing Cilacap as the Project site which reflects the need for sustainable development of the dynamic and rich resources of the Cilacap Segara Anakan Lagoon.

It was noted that many studies have been conducted under the Project in the Cilacap area, but these have been based on individual sectoral approach.

Dr. Purwito Martosubroto suggested that all participants take advantage of the Workshop as opportunity to show all research results to date so that management planning could be directed for the Segara Anakan Lagoon as soon as possible.

1.3. Remarks by Dr. Chua Thia-Eng Coordinator of the ASEAN-US Coastal Resources Management Project.

In line with Dr. Soegiarto's speech, Dr. Chua Thia-Eng reminded the participants about the Project's objectives to promote regional collaboration in coastal zone management and to prepare a coastal management plan for Segara Anakan.

According to Dr. Chua to establish a plan is easier than to implemente it. He pointed out that CRM management not only deals with coastal resources, but also with people. Various interests surface in the coastal zone as is evidenced in many Southeast Asia countries. It is therefore no easy task to prepare a multidisciplinary plan which can resolve conflicts resource use in the area.

Dr. Chua also said that although there is not enough time to begin to solve CRM conflicts in Indonesia, it takes time to implement a workable programme. Although in the US, for example, the CRM programme took 30 years to implement it still has problems and needs improvements. Therefore, he expressed the hope that the participants would share knowledge and ideas about CRM in Cilacap.

2.1. Presentations on Biophysical, Survey Chaired by Aprilani Soegiarto.

2.1.1. Assessment of mangrove degradation and zoning for development, by Subagjo Soemodihardjo

The survey used aerial photographs to evaluate the status of mangrove in the area. The study area was divided into 14 study units. Each study unit required one survey lasting for 10 days, hence for all study units, 14 surveys were needed. At the time, only 3 surveys had been conducted in study units 1, 2, 3, and 5. To point out the study area, the team utilized Perhutani's plots, from 1 to 57.

The mangrove forest was classified using the criteria of percentage of falling trees and of undergrowth cover plants as follows:

1. Category 1, falling trees <10%, undergrowth cover <25%,
2. Category 2, falling trees 20-25%, undergrowth cover 25-50%,
3. Category 3, falling trees 25-50%, undergrowth cover 50-75%,
4. Category 4, falling trees >50%, undergrowth cover >75%.

Following are observations resulting from surveys done in three study units.

1. Study unit 1.

The site is located in the northeastern end of Segara Anakan mangrove area. It is mostly composed of flatland, high ground and submerged mudflats exposed above sea surface during low tide, except for the northwestern part of the site which was in the form of hilly dry land. The plots were numbered 51 to 57 and 47-1/2.

In the high ground of plot 47, the northern part was utilized by Perhutani to grow teak *(Tectona grandis)*, while the western part had been developed into a permanent human settlement. Various food crops were grown. Teak does not grow well. The abundance of *Phragmites karka* seems to inhibit the young teak. The other high ground, plots 50 and 51, was utilized for a plantation of mahogany *(Swiettenia mahagoni)*, lamtoro (*Leucenna* sp) and caliandra.

In those two areas, mangrove trees are physically similar. They appeared to be damaged for quite a long time now. The undergrowth covers are mostly *Acanthus illicifolius, Derris trifoliata* and *Acrosthicum aureum.* There are 5 mangrove trees in the area, and the dominant species are *Sonneratia alba* and *Avicenia alba.* The trees are generally 2 to 3 meters high with DBH not greater than 10 meters. The site was classified into category 1 to 2.

In some portions of the mud flat, represented by plots 55, 56 and 57, *Nypa fructicans* were developed while other mangrove trees like *Sonneratia, Avicenia* and *Rhizophora* began to surface. Resprouts of old time cut-over mangrove emerged. In some area there were vegetation found. This area was classified under Category 3.

2. Study Unit 2.

In the high ground of dry land, 3 human settlements had been established for some generation. People grew paddy as well as food crops in between the villages. The western part of the high ground was utilized by Perhutani in growing teak.

In the case of the mangrove forest, the area laid down from the end of the teak forest to the mouth of Sapuregel river was classified under category 3. It was primarily made up of resprouts of cut-over and young trees that were dominated by *Rhizophora apiculata,* followed by *A. alba.* Those in between Jojok village and Pekulan village fell under category 3. Mangrove vegetation consisted of the sapling of *Sonneratia, Avicenia* and *Excoecaria.* Undergrowth covers, *A. illicifolius,* were found in abundance. The effect of refinery was evident in the bank of Donan river.

The area in the western part was in a better condition than that in the eastern part. Category 2 appeared to be fit to the area. The vegetation was quite dense, although the size was small. There were no trees with a diameter of more than 10 meters. A transect made perpendicular to Sapuregel River indicated a density of 1,050 saplings/ha.

The third zone was represented by plots 48 and 49. Perhutani used a part of the area to grow teak and lamtoro. The density of sapling was 967 individu/ha, with cut-over trees covering 24.7% and undergrowth covers 8.37%.

3. Study Unit 3.

Based on the false colour of aerial photograph, the mangrove area can be divided into 3 main zones. The first zone was laid along Sapuregel river. The second zone was in the western half of the study unit 3, while the third was in the northern side of Ujungalang River and extended up to the northern dryland boundary.

In the first zone, there was strong indication occurred that *R. apiculata* is a dominant species. Mangrove trees with a DBH of more than 10 meters were not found in the area. The falling trees in plots 43 and 44 were more than 70%; indicating a heavy disturbance forest. Moreover, in plot 44 the *Aegiceras*

corniculatum with 2 to 3 meters high grew in abundance. Such a condition indicates a secondary growth after human disturbance.

The second zone, plot 42, was dominated by *R. apiculata*, followed by *Bruguiera gymnorrhiza*. Cut trees amounted to 46.75%, while undergrowth covers were 41.9%. The area seemed to be in a substantially disturbed state. In plot 38, observation found out a wide open space. Reforestation was being conducted by Perhutani in this area. *B. gymnorrhiza* was selected for hard clay cover, while *Rhizophora* sp. was selected for muddy a bottom. The area can be considered as a transition area.

The third zone showed the characteristics of being a transition zone from tidal swamps into dry land ecosystem. Dry land coastal vegetations began to creep in and were dominated by shrubs and stunted mangrove trees interspersed by undergrowth of *Acrosthicum* and *Acanthus*. Reforestation was conducted by Perhgutani using *Rhizophora*.

4. Study Unit 5.

The mangrove communities were reasonably good, although young plants seemed to dominate the communities. Trees with 10 meters DBH were found. A considerable high number of *A. alba* was found in the site observed. The *A. corniculatum* was also quite abundant, although most of them were saplings.

The disturbance occurred generally in the interior part of the forest. The condition was reflected in a significant quantity of *Derris trifoliata* and *A. illicifolius*. The most seriously disturbed mangrove was in plot 41. Illegal cutting appeared to be the most probable reason for its disturbed state. Cut-over trees were estimated to be about 73.2%. The figure indicates that the area was heavily damaged and falls under category 3.

2.1.1.2. The study of water quality of Segara Anakan and its adjacent waters, by Kasijan Romimohtarto.

The parameters observed by this group were key factors which affect water quality, namely:

- oceanographic including DO, Ca, Mg, SO_4^-, pH, temperature, salinity and nutrient salt,
- inorganic pollutants; mostly heavy metal
- organic pollutants which were emphasized on pesticides, and
- biological pollutants such as covered heterotropic, holotolerant, coliform, fecal coli, fecal streptococcus and phatogenic bacteria.

Seasonal occurrence and distribution of planktonic larva were also investigated. About 12 and 10 stations respectively were established for water quality and microbiological studies.

The value of parameters observed during the study varied byarea and time.

In terms of oceanographic parameters, temperature, pH and oxygen content were in the range of quality standards generally set for aquaculture. However, the nutrient content and water chemical values were considered high. In-organic pollutants appeared to be lower than quality standard, except Ni that its value was higher than 0.002 ppm. Pollution of pesticides occurred only in Segara Anakan and Harbour area. The concentrations were also accepted for aquaculture. For microbiological pollution, pollutants existed only in Segara Anakan with values lower than the quality standard set for aquaculture and which generally did not pose a problem.

2.1.1.3. Dynamics of water movement and sedimentation patterns of Cilacap/Segara Anakan Lagoon, by Mulia Purba.

The Segara Anakan Lagoon is a unique coastal ecosystem and an ecologically important marine coastal resource. Due to poor upland management and development, high sedimentation rates occur in the lagoon and its marine resources are gradually decreasing. It is necessary to study the general water flow patterns in the lagoon so that sedimentation patterns and future physical changes can be predicted for management recommendations.

This study was done by reviewing several studies related to Segara Anakan Lagoon water dynamics and sedimentation patterns.

A major source of sediment to the lagoon is the Citanduy River. The water circulation patterns are mainly driven by the tidal energy that enters the lagoon at two entrances and the fresh water discharge. The sediment from Citanduy River which entered the lagoon at the lagoon entrance is distributed in the main body of the lagoon during flood tide. This sediment is deposited mostly in the north, northeastern and eastern shore of the lagoon because water movement was very limited in those areas. Such conditions are suitable for sediment to deposit. The other suitable locations for deposition are in the northeastern side of Karang Anyar Island and the western side of islands in the southeastern part of the lagoon. It is predicted that land accretion will continue in those places and leave the lagoon with tidal inlets and waterways if no action is taken to prevent the siltation.

2.1.1.4. Capture Fisheries,

by Nurzali Naamin.

The study emphasized the role of the lagoon as a nursery ground for offshore fisheries. Sampling took place in the east and west entrances of the lagoon for immigrating larva. For emigrating juveniles sampling was done at the tidal creek in the mangrove area and in the lagoon. Plankton net and Jaring Apong were used during the sampling.

In terms of number, larvae were found in abundance in June, August, January and February in the east entrance, and May, July and December in the west entrance. Larvae caught during the sampling were dominated by *Penaeus merguiensis* and *Metapenaeus ensis*. Juveniles caught during the study consisted of penaeid shrimp, other crustaceans, fish mollusc and jelly fish. Juvenile penaeid shrimp were estimated to be abundant in December, February and May.

Spawning was done in December, September, August and February for *M. ensis*, and July, August, January and November were for *P. merguiensis*. High occurrence of mature *P. merguiensis* was in December to February.

The fishing patterns of fishermen fluctuate. High fishing effort occurs from October to December, which reached 7,000 trips per/day. The highest fishing effort occurred in November. The production, however, was high from September to December, and CPUE was in December to January. Dominating the catch was *M. ensis*, in the west entrance and *P. merguiensis* in the east entrance.

2.1.1.5. Lagoon and Culture Fisheries
by Edi Mulyadi Amin.

The study had three objectives, namely, to evaluate the present status of the lagoon fishery, to study the availability of seed and spawner, and to observe characteristics of the land and water. Emphasis of the study was on fishing gear used for commercial purposes, such as trammel net, monofilament gill net, Jaring Apong, Wadong, Waring Surungan and Wide Tadahan.

The operation of each fishing gear was concentrated in certain areas. Trammel nets were mostly found in the area where water level was reasonably deep and currents very strong. Wide Tadahan and Jaring Apong were found only in Cibereum, Ujung Gagak and Ujung Alang. Waring Surungan were operated only in Ujung Gagak, Cibeurem and Bugel. Wadong which was specially used for crabs were operated in swamp areas or in mangrove forests.

Aquaculture is possible in the area since land is available and shrimp larva occurr in abundance.

Catch composition varied among the fishing gears and seasons. Trammel nets and gill nets operated in July 1987 caught mostly Scatophagidae, while those operated from September to December 1987 caught mostly Penaeidae. In January 1988, the dominant species was Mugillidae. Apong caught more varied than trammel nets and gill nets. In July, September, November and December 1987, Apong caught Metapenaeidae, Sergestidae, Engrauilidae and Clupeidae. In January and February 1988,the dominant catch of Apong was very similar to that of Wide Tadahan and Waring Surungan, i.e., Penaeidae and Metapenaeidae.

Based on length and frequency distribution, fish caught during the course of the study were quite small and showed a potential for culturing.

Oyster spat abundance which was observed using bamboo and nylon ropes appeared to be very low compared with that in Gegara Menyan. There were only 20 oyster spats attached in 5 line collectors set from July to December 1987. The highest density of oyster spat occurred in July 1987. An average of 2,428 individu/m^3 were observed in stations 3,4 and 5; considering that spat abundance were low and siltation was high. Oyster culture is not recommended.

Physical and chemical water quality varied by season. During the rainy season, water quality parameters observed generally decreased, except for the temperature's values. Salinity and transparency reached their lowest value, i.e., 2.42 ppm and 0.34 meters, respectively. The lowest temperature, 25.80°C, occurred in July 1987. Currents occurred mostly during full and new moon. Strong currents were found in navigational channel with the strongest one occurring in February 1988.

Observation of phytoplankton showed that community was dominated by diatoms (*Chaetoceros* spp., *Thallascothrix* spp., *Nitchia* spp., and *Rhyzosolenia* spp.) and dinoflagellates (*Ceratium* spp. and *Peridinium* spp.). Compared with plankton density in Gegara Menyan, the value in Segara Anakan was very low.

2.1.2. Biophysical Working Group Presentation. by Mulia Purba (Chairman of Working Group I), Chaired by Alan White

1. Introduction.

The Segara Anakan is a very valuable and unique coastal ecosystem in its capacity as a nursery ground for marine organisms, especially shrimp. Economically, the value of the lagoon is reflected not in its fisheries production, but in the

production of the coastal and offshore waters of the Cilacap area.

The main environmental problem in the lagoon is a high sedimentation rate which results in a considerable decrease in water surface area. If there is no action taken to prevent this process, the lagoon will be filled up and left only with water ways and tidal inlets.

Such a condition poses a serious threat to the lagoon. The function of the lagoon as a nursery ground for marine organism can be well executed only if the main water body of the lagoon can be maintained as it is at present.

Other factors that may threaten the lagoon's ecological function are the degradation of mangrove forest and the water quality of the lagoon.

The biophysical management plan of the lagoon should address the above-mentioned issues.

2. Technical progress.

a. *Capture/lagoon fisheries.*

Accomplished were 13 out of 20 trips planned for capture fisheries and 7 trips out of 10 trips planned for lagoon/culture fisheries, a considerable amount of data and information have been obtained, such as fluctuation of maturing gonad (for identification of spawning season), fluctuation of immigrating larvae and emigrating juveniles from Segara Anakan to the sea, fishing season and rainfall, length frequency of dominant shrimp and fish caught, as well as fisheries activities in offshore areas.

From lagoon/culture fisheries sampling activities several data and information have been obtained, such as fishing effort (trips), catch, catch composition, spat and larvae for aquaculture, and some water characteristics (temperature, salinity, transparency, current and plankton).

Based on the above-mentioned data and information the preliminary conclusion is that Segara Anakan lagoon and its surrounding mangrove ecosystem are the most important nursery ground for offshore marine aquatic animals especially the Penaeid shrimp and as such, have a high economic value for the offshore fisheries in terms of dollars or rupiah. The lagoon fisheries of itself has a low economic value, since the catch consists of small juveniles of shrimp and fish.

Other issues that can be derived from the available data and information are on production trend and MSY.

Based on the serial data of the lagoon fisheries, it seems that the catch or production tends to decrease from year to year, and that the lagoon stock has been over exploited. In contrast, however, the offshore fisheries stock is still under exploited (20-40%).

Present MSY estimated for offshore shrimp fisheries is about 2,100 ton, which is lower than previous (trawl era) estimates because the present calculation accounts only for the large type of shrimp.

b. *Mangrove condition.*

Generally speaking, the Segara Anakan mangrove has under gone much degradation. In some localities the damage was quite intense (category 3). Legal production exploitation is currently nonexistent, due to the fact that mangroves with a diameter of more than 10 cm are very rare. However, illegal cutting keeps on being done. The State Forest Enterprise which is responsible for the management of the mangrove forest, sets aside a substantial amount of funds to rehabilitate the degraded mangrove forests.

To facilitate management of Segara Anakan as a nursery ground, and to gain maximum utilization of the mangrove resources, an appropriate zonation scheme is envisaged as follows:

b.1. mangrove green belt surrounding the lagoon,

b.2. conservation zone,

b.3. utility zone, and

b.4. conversion zone.

Up until the present, field observations carried out by Task 210-I have been limited to the eastern half of the mangrove area. In order to obtain a better idea of the condition of the entire mangrove resources, observations of the western half are necessary.

c. *Water quality.*

The study on the water quality of Segara Anakan Lagoon focused on the importance of water for fisheries, i.e., as nursery ground for many species of shrimp and fish, lagoon fisheries and aquaculture. The special issues in the water quality management are:

c.1. The existing threats that the water quality of Segara Anakan may face, i.e.:

- various industrial activities such as oil refinery, cement factory, fertilizer packaging and harbour activities which produces pollutants;
- village communities which may produce organic pollutants;
- Citanduy and other rivers which cause sedimentation and may carry pesticide residue from griculture activities;
- floods which transport silt and cause drastic drop in salinity; and
- oil spills from transport boat engines and ferries in the Cilacap waters or even from tankers in the Indian Ocean.

c.2. Assessment of existing preventive measures:

- waste treatment plants,
- national standard water quality regulation,
- national contingency plan, and
- upland management scheme.

c.3. Water quality monitoring programmes of Segara Anakan consisting of:

- key parameters to be measured,
- frequency of observation,
- organization, and
- budget plan and collection.

d. *Water dynamics and sedimentation.*

Water dynamics and sedimentation in the lagoon are generally well understood. The mathematical model developed by PRC Engineering Inc., predicts a reasonably good agreement between the result of the model and the observation on water level fluctuation. However, in terms of predicting horizontal water flow, the model merely produces an indication of the water flow. To get a better understanding of horizontal flow, more discussions on the model of water flow within the Citanduy River Basin Project are needed.

The water dynamics and sedimentation task will have to be done with other tasks in the Biophysical Division, especially in order to understand the relation of the water dynamics to the water quality parameter, as well as distribution and behaviour of certain lagoon organisms.

3. Information gaps.

During the past several months data collections have been carried out, the results of which were presented in this workshop. Only a portion of the planned activities were conducted. Based on the above activities, some information gaps were identified as follows:

a. *Capture/lagoon fisheries.*

Even with 13 trips (65%) accomplished out of 20 trips planned, there were still some gaps. The reliability of the present results should be examined. The frequency of sampling that could not be executed as planned before resulted in data gaps. Therefore, it is difficult at present to conclude that the Segara Anakan lagoon is a nursery ground. Other information gaps are the follows:

a.1. the biomass of shrimp and fish in the lagoon,

a.2. the method for estimating the biomass of shrimp and fish in the lagoon,

a.3. the minimal size of mangrove swamp needed as sustainable nursery ground, and

a.4. the size of Segara Anakan lagoon needed to meet its ecological role as nursery ground.

To fill in the above mentioned gaps of information, fisheries research has to be strengthened.

b. *Mangrove condition.*

b.1. lack of a base line map of mangrove resources,

b.2. lack of information on illegal mangrove resources harvested by the local population,

b.3. lack of information on the productivity and standing stock of mangroves, and

b.4. need for the most recent aerial photographs.

c. *Water quality.*

c.1. water quality maps to define the distributional patterns and to identify critical areas,

c.2. data on waste water treatment plants from each factory,

c.3. other secondary data,

c.4. seasonal variation in water quality to determine the occurrence of extreme conditions, i.e. peak and worst seasons at least within a calendar year.

d. *Water dynamics and sedimentation.*

d.1. lack of discussion with PRC Engineering Consultants on the model they developed to predict the water movement of the lagoon. To remedy this problem, such discussion should be conducted.

4. *Major management problems.*

Priority should be given to the following management problems:

a. sedimentation,

b. overexploitation/nursery management,

c. mangrove degradation, and

d. flood.

5. *Primary causes.*

a. upland agricultural practices,

b. very fine mesh size of fishing gears,

c. excess number of fishing gears, and

d. poverty among the local human population.

6. *Practical management strategy.*

a. *Sedimentation.*

The sedimentation problem in the lagoon has not resulted from processes confined to the lagoon itself, but rather involve a very large region. Most of the sediment deposited in the lagoon is brought by freshwater discharge of Citanduy and Cikonde Rivers. The soil erosion of the river basin is quite high due to intensive land use and poor soil conservation practices. Development of Citanduy and Cikonde Rivers even enhance the rate of sedimentation because of more river water channelled directly to the lagoon.

Although the sedimentation process in the lagoon are closely related to the water dynamics of the lagoon, mitigation measures to prevent the lagoon siltation must also include the activities in the upland.

There are several mitigation measures that can be done to prevent lagoon siltation. These measures are mainly based on the following three principles:

a.1. decreasing or preventing soil erosion in the upland,
a.2. diversion of Citanduy River mouth, and
a.3. manipulate the water movement in the lagoon so that the water can carry more sediment to the ocean.

All of those measures are so costly that we recommend the Citanduy River Basin Project to implement the measures.

b. *Over fishing/nursery ground.*

The following are some management measures that should be taken into account:

b.1. regulate the mesh size of fishing gears, reduce the number of fishing gears used, and maintain the present size of Segara Anakan lagoon.

b.2. allocate some mangrove areas for aquaculture development since aquaculture is an alternative for fishermen in the lagoon fishery.

c. *Mangrove degradation.*

c.1. establish mangrove zoning into green belt, conservation, utility and conversion zones,

c.2. enforce implementation of the mangrove zoning, and

c.3. rehabilitate degraded mangroves.

d. *Flood.*

The water dynamics of the lagoon plays an important role in the distribution of water quality parameter in the lagoon. The water supply to the lagoon mostly came from the ocean during flood tide and from Citanduy River. During the rainy season, high rainfall in the Citanduy basin can cause the Citanduy River to deliver an enormous amount of freshwater to the lagoon. This freshwater discharge causes severe drop in lagoon salinity and increasing sediment supply that poses a threat to the ecological function of the lagoon. However, since this flood problem is part of

Citanduy River Basin Project we recommend that this project will be responsible for mitigating the flood problem.

2.1.3. Discussion on Biophysical. Chaired by Aprilani Soegiarto.

Purwito. My general response to the Biophysical presentations is that the work on mangroves should be focused on the western part of the lagoon. This is because the movement of the water in the western part is very dynamic as shown by Mulia Purba. Also, Nurzali's statement on decreasing fish production as to whether the trend is due to a decrease of nursery ground or of the fishing ground in effect needs to be clarified. Regarding the sedimentation process, some fishing gears, like traps, are increasing the process and that oyster culture may also increase sedimentation.

Henk. With respect to mangrove disturbances, I have two questions : To what extent has the mangrove in the Lagoon been disturbed by Pertamina, and what area of mangrove forest is still in good condition. I think we need to clarify these points. I also suggest including the study on fisheries management in the Lagoon.

Subagjo. About disturbances by Pertamina, the influence is very minimal. Some replanting has been done, although, some of the plants died due to unknown causes.

Kasijan. The concentration of oil in water is less than 5 ppm and is not considered a problem.

Henk. The Biophysics group is related to the Citanduy River Project and should coordinate with the Project. Dr. Aprilani Soegiarto could help facilitate such linkages to the Project, especially the Biophysical group, with Citanduy River Project.

Purba. Close links are important with the Citanduy River Project because:

- the result of Citanduy River Project will be beneficial to the CRM Project,
- the need to control water movement of the lagoon is very obvious and this work is highly influenced by the work of River Citanduy Project,
- the Project requires the Citanduy River Project's input or comment on its work, and
- since the Citanduy River Project is large, it cannot be ignored but must be collaborated on.

Chua. Collaborative work between the CRM Project and Citanduy River Project is necessary, since the lagoon and Citanduy River cannot be separated. As long as the effect of Citanduy River on the lagoon is large the impact should be analyzed and considered. The lagoon plays an important ecological and economical role as a nursery ground. It is seen in the high fish production of up to 40 tons/year. However, the Project should also consider whether the lagoon is really capable of supporting an offshore fishery of fish and shrimp. In order to establish this Nurzali should prepare a substantial paper justifying the Lagoon as a nursery ground, strengthen the lagoon fisheries assessment, and see how much fish can be exploited on a sustainable level. The Project should also consider in its planning the fact that people are difficult to displace. Increasing livelihoods of the people by altering of the environment, in terms of mangrove and lagoon management for aquaculture and new land uses should be considered.

Purwito. In order to see the ecological role of the lagoon for fisheries, Nurzali should work with Purba to determine the detention time of water in the lagoon.

Purba. The funds are limited for such studies.

Chua. Much expertise is indeed required for this analysis but efforts at data gathering can be solved if the Project uses existing data from past research.

White. An economic analysis is required to show the true value of the lagoon as a nursery area for offshore fisheries. This can be done with existing data if some assumptions are made regarding the quantity of juvenile shrimps used in the lagoon.

2.2.1. Presentations on Socio-Economic Survey Chaired by Henk Uktolseja.

2.2.1.1. Baseline Socio-Economic Survey, by Budihardjo.

The survey singled out 10% of households in Kampung Laut as respondents. After household-listing had been made respondents were selected through systematic random sampling. So far only 75% of respondents had been analyzed.

The study observed that in Kampung Laut family size is dominated by 5-7 members in one family, or around 61.9%. Those which consist of less than 5 comprise 23.8% and those of more than 7 comprise 14.3%. The people engage mostly in fishing

(86.8%), followed by farming (4.8%), and others at only 8.4%. In addition, 26.5% of respondents undertake minor occupations such as petty trade, fish processing, etc. Fishing is a traditional activity. Some people have been engaged in fishing activities for more than 15 years now, while farming has just been started about 5 years ago.

Combined fishing dominates the activity of fishermen at 68%. Other fishing activities were fishing for only fish, shrimp and crab at 14.3%, 11.4%, and 5.7%, respectively. In terms of income, crab fishermen earned more than the others. On the average, crab fishermen earn more than Rp. 100,000 per month, and so do shrimp fishermen. Combined and fish fishermen earn around Rp. 50,000 to Rp 100,000 per month.

Among the villages in Kampung Laut, Ujung Alang inhabitants earn an average of Rp. 60,396 per month, while those in Ujung Gagak and Muara Dua earn only Rp. 49,525 and Rp. 44,719, respectively. Their average income expectation was around Rp. 75,000.

The high income of Ujung Alang inhabitants is due to support from farming and non-farming activities that amount to around Rp. 8,357 and Rp 17,152, respectively. In Ujung Gagak and Muara Dua, support from other activities is minimal. Even in Ujung Gagak, no support comes from farming. The figures indicate that income generating opportunities in Ujung Alang are better than those in Ujung Gagak and Muara Dua. The major existing income sources in the villages are:

a. capture fisheries,
b. aquaculture,
c. farming,
d. animal husbandry,
e. home industry, and
f. services

Observation on the constraint to increase income found the following causes:

a. lack of capital, 72.7%,
b. resources degradation, 18.3%,
c. marketing problem, 4%,
d. technology problem, 2.6% and
e. others, 3.4%.

2.2.2. Socio-Economic Working Group Presentation. by Purwito Martosubroto (Chairman of Working Group II), Chaired by Alan White

1. Introduction.

The Segara Anakan lagoon is an estuarine environment or brackishwater area of approximately 20,000 ha, located in the western part of Cilacap regency - south coast of Central Java Province. This lagoon is surrounded by a large area of mangrove, and considered as the last extensive area of mangrove left in Java. This productive environment provides substantial support for the inhabitants of Cilacap through its productive offshore fishery, and for the local inhabitants of Segara Anakan by providing lagoon fishery. As reflected from the number of households that live in the area, around 86.8%, depend on fishing activity in the lagoon.

The role of the lagoon fishery relative to the total fishery is still low. Before the trawls were banned in 1979, production generated about 281.9 ton or 1.3% of total fisheries production. However, in 1984 production of the lagoon amounted to 361.5 ton or 10.1% of the total production of Cilacap regency.

The total population in 3 main villages of Segara Anakan (Ujung Alang, Ujung Gagak and Muara Dua) in 1986 was 7,654 and the growth rate has been relatively stable during the last four years. Based on the survey data in 1975, 90.4% of household in Kampung Laut were fishermen and 1.8% were farmers. In 1987, the figures were changed 86.8% and 4.8% for fishermen and farmers respectively.

The accretion of land and subsequent growth of the island in the lagoon allows more farming activities (especially in Ujung Alang and Muara Dua) as a minor occupation aside from fishing.

In relation to the CRM, the main issue felt by inhabitants in Kampung Laut was extreme poverty shown by poor living conditions reflected in poor housing, food, education, sanitation, etc. The national poverty threshold was originally pegged at 320 and 480 kg of rice equivalent yearly for rural and urban area, respectively. The highest income during peak season in 1987 was approximately Rp. 10,000.- per capita per month, meanwhile 320 kg of rice equivalent yearly in 1987 was Rp. 14,600 per capita per month. Diminishing fishing ground and degradation of fishing resources owing to the rapid sedimentation in the lagoon cause fishing productivity of the fishermen to decline drastically and affected the fishermen's income which depended mainly on the fishing activity. Therefore, many of the inhabitants live at or below the national poverty threshold, so that just to fulfill their daily needs they will exploit mangroves to get a block of land for farming, fish pond and other activities.

Because of the low education level (60.1% of people were illiterate in 1980) the inhabitants of Kampung Laut depend on the local trader as the only source of financing in the coastal villages. This dependency creates indebtedness to "patroon" through "system ijon" or contractual scale before harvest.

Since 1979, the government has been rendering assistance to improve the inhabitants' living condition by conducting a transmigration programme. However, most inhabitant of Kampung Laut were against the idea for reasons related to the legend of Mataram Kingdom and other historical background.

2. Research progress.

The Socioeconomic team has conducted 3 field trip surveys to collect base line data on:

a. occupation : main, minor, experiences, etc.,

b. income : production and income level, existing income sources, income structure, etc.,

c. perception of resource users on:
constraints to increasing income, trend of production/income, and diversification of income.

d. asset ownership pattern:
for fishing, farming, non farming and enterprise.

e. demographic parameters:
population, sex-age composition, family size, dependency ratio, migration, etc.

f. secondary data:
monograph data in the region and village level.

Based on the survey data analysis, one may preliminarily conclude that fishing activity in coastal villages of Segara Anakan lagoon still plays a main role as traditional occupation. However, most inhabitants are in extreme poverty condition (below national poverty threshold). In order to avoid mangrove destruction, it is important to provide alternative income sources for the fishermen by continually conducting socio-economic surveys to calculate and analyzing existing income generating opportunities.

3. Information gaps.

The following are some identified information gaps to be filled in in the near future:

a. alternative livelihood for the fishermen/inhabitants,

b. level of existing technologies for fishing, farming and non-farming activities in the coastal village of Segara Anakan,

c. marketing system for selected commodities,

d. economic analysis of selected income sources:

- fishing (by fishing gears),
- farming (crop, backyard animal husbandry), and
- non-farming (home industry, services, etc.).

e. socio-cultural aspect:

- fishing rights,
- group dynamics,
- aspirations.

4. Management problems.

Priorities of the management problems in the lagoon area are as follows:

a. extreme poverty,

b. high level of illiteracy,

c. resistance to transmigration efforts

d. resource use conflicts, and

e. land tenure acquisition.

5. Primary causes.

a. dwindling fishing grounds and degradation of resources,

b. low productivity and use of traditional technology,

c. contractual level and infrastructure facilities (isolated area), and

d. traditional fishing right system.

6. Practical management strategies.

a. to provide alternative livelihood,

b. developing fishing right system,

c. developing human resources:

- education,
- extension,
- health services,
- women's participation, and
- improvement of the marketing system.

2.2.3. Discussion on Socio-Economic. Chaired by Henk Uktolseja.

Husein. The most important aspect that must be considered is that of alternative employment opportunities. Other forms of employment in the area and its surrounding area such as offshore fishing, trade, services and home industries are examples. Lagoon fisheries are limited and we need a way to attract people to move from fisheries to other activities and to improve marketing. Use of BC Ratio value by the Socio-Economic group to express the feasibility of each fishing gear is not accurate and should be replaced by return of labor.

Purwito. The dependency of fishermen on the middle man needs analysis.

Budihardjo. The BC Ratio value used is very simple and could be considered as mere income statement. The marketing system must also be improved.

Santosa. Diversification of activities based on the development potential is needed. Aquaculture, agriculture and post harvest activities are possibilities. However, such activities must be market oriented and new technology could be considered. In order to improve the social welfare of the people, group dynamics is useful as a means of enhancing marketing of local products. Key persons are necessary in this process.

Nurzali. The Socio-Economic group needs to consider the fishermen's attitude and skills. This study is in line with the Biophysical group's observation that the number of fishermen operating inshore must be reduced. Offshore fisheries is one alternative. The fisheries production figure shown by the Socio-Economic group support the Biophysical group's analysis of the occurrence of high fishing pressure on gravid prawn from trawl operations.

White. The means of providing alternative sources of income is the main consideration in the short and long term for the improvement of social welfare in the area. The

fishermen will respond immediately to real benefits accrued to them in the short and medium term.

Henk. We must stress the future activities using other resources outside of fisheries. The role of women must also be considered. Their role is not recognized and may be more important than currently thought.

Budihardjo. I will also extend the infrastructure study not only to include roads etc., but also organizations and markets as well.

Husein. I do not agree with the use of BC Ratio value and suggest using instead return of labour. The traditional technology is already there in the communities and people will suffer from a lot of additional technology. Post harvest diversification will not improve household income much.

Chua. In summary the Socio-Economic group's findings must support the over all management. In this regard the study must consider alternative programmes and see whether people want to change their activities or whether technology is appropriate. We need to note people's activities during off season. The general emphasis of the study is good and the role of the women is indeed important, since they handle the family's purse string. The dependency of people on the middle man may also be a problem. An important thing that the Socio-Economic group has overlooked is economic valuation of the resources. Economic valuation defines how important resources are to people. In order to improve methods, the Socio-Economic network at ICLARM might be useful.

White. In summary, we should determine the feasibility and profitability of limited aquaculture in the area. There is already a movement toward fish farming in Klaces which will undoubtedly continue. Planning here is important.

2.3. Legal/Institutional, Chaired by Henk Uktolseja.

2.3.1. Cultural survey on environmental CRM awareness in Cilacap Segara Anakan, by Winarno Yudho.

In general, people's understanding of environmental protection is quite high. The study observed that most of them, 94% of the interviewees, know about the environment protection law. However, only around 77% of the interviewees understand that mangrove cutting is against the law and only 59.9% think that the law is properly established. Of those who consider that the law is properly established, 91% understand that the land belongs to the government or is under government regulation.

A considerable number of people, around 43.3% of interviewee, know of such a regulation from their friends. The government officers' role in informing people of such a regulation can be considered low, since only 27%, 10.8% and 2.7% of interviewee were informed by Perhutani, village and field extension officers, respectively.

A high percentage of interviewees, 82%, obeyed the regulation, 65% of which were afraid of the punishment. Of those who disobey, 62% think that the regulation limits the fulfillment of their daily needs.

In terms of disobeying the regulation, people think that cutting mangroye out of their village is the most illegal activity (69% of interviewee). The second most illegal is fishing which utilizes explosive substances (25% of interviewee), followed by cutting big diameter of mangrove in the forest (6%).

Cutting mangrove seems to be quite popular among the people, since 71% of interviewee have heard or seen people cutting mangrove. The intensity of mangrove cutting may increase in time, since people will not report to the government officers others who cut mangrove.

This low participation in the environment appears to have resulted from low education, limited choice and reluctance to change livelihood. Among the inhabitants in Kampung Laut, estimated around 7,184, only 584 have attended formal education.

Most of them 375 people graduated only from elementary school. Those who graduated from junior and senior high school were only 83 and 46 people respectively.

2.3.1.2. Evaluation of perception and attitudes of public officers pertaining to environmental policy/CRM

implementation, by Agus Brotosusilo.

The main issues in the Segara Anakan are poverty and high sedimentation.

In order to improve the people's socioeconomic status, the local government implemented transmigration programme. This programme has been implemented four times now in Panikel village, which is beset most by the problem of poverty. Perhutani has also offered to move Panikel inhabitants to Ciherang village. The movement of people is also aimed at reducing the problem of mangrove cutting for fire wood and agriculture land requirements. However, these measures failed due to the reluctance of the people to move. Those who have been transmigrated are now returning to the area. They can not adapt to the new environment and accept a rapid change of livelihood from fishing to farming. In addition, people also realize that in their surrounding area marginal land is fertile that attract them to stay and exploit. An old saying that people in Segara Anakan will get their welfare when Java Island joins Nusa Kambangan Island, is also causing people to be passive, posses a waiting spirit and reluctance to any development.

In the face of such problems the local government changed the target by involving the young generation through improving their education. The non-government organization, YSPS, has also participated in that educational improvement programme.

To reduce the rate of sedimentation the local government has also implemented a project on Pengembangan Dampak Model Farm. The project traines people to manage their land properly, such as how to make a dike or terrace.

The study observed in general that the government officers strongly intend to apply CRM properly for the betterment of the people's welfare. However, dispute among the law inhibit the implementation. Perhutani's work is based on Forestry Ministerial Decree No. 5 of 1967 stating that all marginal land lies under the jurisdiction of the Ministry of Forestry, while local government is based on the Home Affair Ministerial Decree No. 5 of 1974 which states the village must look for funds to run its daily activities. However, since land status is still in dispute, the villages in the Segara Anakan area do not have Village Lands or "Tanah Desa" as an income source such as those villages in other areas in Java Island.

2.3.3. Legal/Institutional Working Group Presentation. by Henk Uktolseja (Chairman of Working Group III). Chaired by Alan White.

1. Introduction.

Group III discussed environmental matters related to legal/institutional framework based on the following projects:

a. Task 410-I, Culture-oriented survey on environmental CRM awareness in the Cilacap Segara Anakan area,

b. Task 420-I, Evaluation of perception and attitudes of public officials pertaining to environmental policy of CRM, and

c. Task 430-I, Evaluation of environmental laws and regulations in the Cilacap Segara Anakan area (which was not implemented, for some technical reasons).

The first two Tasks -- Nos. 410-I and 420-I were intended to support the overall target of the last Task - No. 430-I.

Generally the coastal community in the Cilacap-Segara Anakan, is caught in a cycle of poverty. This causes people to forego environmental enhancement and sustainable resource use practices. In the interest of maintaining marine and coastal resources for the benefit of future generations, the coastal community needs additional options to support their lives in a sustainable manner. While from another point a view, it was also known that the attraction for coastal zone management and development is not derived primarily from the resources of the sea itself, but rather from the broader uses made of coastal land resources.

2. Scope of work.

After a lengthy discussiqon, the legal/institutional working group, decided to focus their considerations on the "Mangrove in Cilacap Segara Anakan area", since this mangrove area remains the largest one in Java and has a close relationship with fisheries in the region - south coast of Java.

3. Existing problems.

The people in coastal communities will play a key role in the future development of the marine and coastal sector as active participations in its economic development, and as social and economic beneficiaries. Most coastal villages in this region of Cilacap Segara Anakan are classified as traditional fisheries villages which means (according to the classification scheme of the Ministry of Home Affairs) the average income is low, since the area follows a traditional culture. The village's social, economic, productive and/or cultural infrastructure are poor and must be led into new initiatives rather than being left self motivated. Consequently, a lot of problems were raised as a

result of the above mentioned shortcomings in the Legal/Institutional Framework.

Within the limited "Scope of work" as mentioned above, the following could be stipulated as existing problems due to severe factors (e.g., low income and living standard, low level of education, and low wisdom of legal culture) are among others:

a. lack of information and related matters concerning the situation and condition of existing mangrove resources,

b. the status of land accretion surrounding the lagoon and its vicinity, as well as the role of law enforcers, and

c. boundary disputes or disagreements among Perhutani (who does the forestry rehabilitation and replanting activities), the local people who have inherited the land, and the local government's local Policy Plan.

Other management problems related to the legal/institutional framework arise from the people themselves what with low lend of educational attainment and high level of illiteracy, making the introduction and implementation of several laws and regulations, a big problem for them to understand.

From the point of view of "institutional setting" it is understood that since we are now facing environmental issues, which should be based on a crossectoral and multidisciplinary approach, the shift from a sector wide idea to a coordinated planning process will allow us to fulfill the ultimate target we are trying to achieve, but still under the coordination of the local government (Pemda).

4. Practical management strategies.

From the legal system, the strategy for looking into the framework consists of the following types of analyses:

a. subtantive, which deals with the laws and regulations,

b. structural, which involves the legal enforcers, public officials and facilities related to certain laws and regulations, and

c. cultural, which is related to the values and attitudes of the people towards the existing laws issued by the government.

Based on the results of Task 410-I and 420-I and related matters, the procedural steps were followed by Group III which also came up with a list of subjects, problems, causes, priorities, in facing future CRM strategy.

A summary of the group's findings on legal/institutional related matters is described in table 1.

2.3.4. Discussion on Legal/Institution.
Chaired by Chua Thia-Eng.

Dikdik. The task is expected to come up with a recommendation on the scale of development with guiding regulations. In other words, it should determined the maximum land area utilized for a certain activity and the type of activity that could be applied (nucleus estate system or other systems).

Chua. The Legal group needs to look into the existing legal and institutional arrangements and analyze whether those laws and institutions are sufficient to handle the implementation of a CRM plan. Local institutions are important in this regard.

White. The conflicts among institutions in the area, such as forestry and land use, fishing rights, ownership of land on Nusa Kambangan, etc. need to be analyzed. The Legal/Institutional group needs to look into the practical side of management from a local perspective as well.

Purwito. Lack of public awareness in the area has been mentioned by the task group. However, the reasons for such conditions are not clearly stated. The task group should also try to see ways to solve the legal conflicts within the law. What also must be considered is whether the conflict should be resolved in the area (locally) brought up to the higher level.

Malonda. Since Bupati is the Chief of the area, the implementation of law must be his responsibility. In other words, Bupati must be allowed to govern the area without much external influence. Consultation with the local government, and Agency of Justice should also be considered.

Chua. Malonda's statement regarding the giving of responsibility of implementation to Bupati is agreeable, However, the executing agency should also be clearly stated. The law should also be workable. In other words, the law cannot be effective unless implementation is supported by the local people.

2.4. Planning and Procedure,

Chaired by Chua Thia-Eng.

2.4.1. CRM Planning Process, by Purwito Martosubroto.

This presentation intends to elaborate the process undertaken by division 600, headed by Koesoebiono, in coming up with CRM management plans and policies (see figure 1).

Division 600 mostly works with secondary basic information and collected by the other division tasks. The original information gathered from the CR profile help the Project's division tasks identify information gaps and tasks required in the field to fill in the gaps. The information gathered from the field is then summarized in the form of papers presented in this workshop for comments and refinements.

After gathering comments and inputs from the workshop the task groups will continue their work and at the end will come up with recommendations for policy and management. Consultation with local leaders, both government and non-government, will need to be conducted for better results.

From this point hence, division 600 will work with PI's to define management issues, policy and management plans. Small workshops will also need to be undertaken in order to help the teams digest and summarize data and define policy. After that, the team will work with each PI to provide management policy. The team will come up with a planning management policy, in consultation with local government and non government bodies.

2.4.2. Coastal Resources Management Strategies The Segara Anakan Case by Koesoebiono and and Chairul Muluk.

Understanding the ecological processes and evaluating the consequences of the processes are important in formulating the development of a natural resources management strategy. The prominent process in the Segara Anakan is identified as high sedimentation. The sedimentation changes the ecological component in the lagoon such as shoaling, water area, hydrology, water quality, habitat, etc. Sedimentation thus causes a decline in fisheries•production, conflict of resource use, life patterns, etc.

Since the main goal is human welfare, the management strategy should consider sustainability, social acceptability, and technological approaches. Alternative employment should also be considered. The management strategy encompasses:

1. the alternative use of resources,

2. land use zonation, and
3. controlled resources use.

2.4.3. Some notes on the coastal zone management in Indonesia, by Henk Uktolseja.

This paper merely highlights some aspects of coastal zone management, since the concept of coastal zone management itself is still in the process of finalization by various Governmental Sectors and related Agencies under the coordination of the State Ministry for Population and the Environment, prior to its implementation. The management of the living environment, according to the Act of the Republic of Indonesia No. 4 of 1982 concerning basic provisions for the Management of the Living Environment, is based upon the sustenance capability of the harmonious and balanced environment to support continued development for the improvement of human welfare. Thus, the objectives of the management itself are:

a. achieving harmony between man and environment;

b. controlling the utilization of natural resources;

c. development of the living environment;

d. implementation of development with environmental considerations for present and future generations; and

e. protection of environmental damage and pollution.

2.4.4. Local Development Planning and Procedures, by Henry Suparno.

The conceptual framework of regional development planning in Indonesia is based on the 5 year development plan or Pelita. GBHN or National Policy will be a guideline for regional government to establish a Regional Policy and in turn as a guideline for district government to establish Local Policy. Having those policies, each government level sets up a plan or programme and estimates the annual budget.

In the case of Central Java, the regional policy is aimed to implement, support and improve national development in Central Java. Strategy approaches are problem solving and optimal use of the resources. The Policy is divided into 3 main aspect, i.e., sectorial, spatial and financing.

Based on the above policy, the government established a 5 year plan or programme with the objectives to lay down a strong foundation for subsequences development and to improve people

welfare. The implementation policy is in-line with regional policy.

The budget estimated to implement such a programme is about Rp. 11.4 billion of which 42% is from the government and 58% from private sectors. The procedure to get the budget is first the government proposal to the Local Assembly (DPRD) for approval and finally sent to the Home Affair Ministry for approval. The system requires a balanced budget, where income is equal to expenses. The budget is allocated for two main issues, i.e., non development budget and development budget that includes coastal resources development (see table 2).

In the case of CRM in Central Java, there are two main components namely human resources development, and natural resources development. For CRM in Cilacap, the development is covering 7 subdistricts, includes Segara Anakan and Nusa Kambangan Island. Seven main problems are observed in Cilacap area, i.e., rapid soil erosion and sedimentation, land hunger, rapid change in living patterns, water-borne diseases, formal "isolation", vast area, and unique flora and fauna.

2.4.5. Land Tenure in Cilacap Area, by Suprapto.

The government of Cilacap thinks that development of the area should be integrally planned. In other words, the development of Segara Anakan will not be put aside. The government therefore includes Nusa Kambangan Island in the development planning, although the island is still under the Ministry of Justice. The administrative process which for the local government has to undertake in order to have an authority over Nusa Kambangan Island is under consideration.

Other conflicts of land use occur between the local government with Perhutani (Forestry State Enterprise). The local government based its development on the Home Affair Ministerial Decree No. 5 of 1973 which states that all land requirements should be addressed to the Ministry of Home Affair cq. Directorate General of Land Use. In the other part, Perhutani claims that all marginal land is automatically under Perhutani authorization. To solve the problem, interdepartmental collaborative work is proposed and still under consideration.

Table 2. Budget Allocation of Central Java Province.

Items	Remarks
1. Non-development budget	- Salary and personnel

	expenses
	- travel expenses
	- maintenance expenses
2. Development budget (priority)	- transportation, communi-tion and tourism
	- agriculture irrigation
	- administration development
	- regional, rural and urban development*
	- education and culture
	- health and social welfare
	- enterprises development
	- minning and energy

* including coastal resources development
  - 15 (out of 35) district in coastal area
  - 85 (out of 502) subdistrict in coastal area

In the case of mangrove forests, the local government has asked for clarification regarding how far from the coast mangroves should be protected, so that planning can be properly established. Zonation is being proposed by the local government agencies, especially of Ministry of Forestry and Ministry of Home Affair.

Other problems being considered are high sedimentation rates, and the reluctance of the people to move away from their area especially those of Panikel village. The sedimentation is estimated to increase with time as long as siltation process takes place in the upper land and this is not under the Cilacap government to regulate.

In the establishment of management planning for Cilacap the local government proposes that the Project consider whether such a plan can be implemented or not.

2.4.6. Planning and Procedure Working Group Presentation. by Koesoebiono (Chairman of Working Group IV).

Management plan formulation is undertaken in 4 tasks of division 600, namely task 610-I, 620-I, 630-I and 640-I. A diagram illustrating the process of formulating management plan is presented in figure 2.

In coming up with guidelines or policies for CRM, task 610-I first establishes a working committee. Regular meetings and small workshops are be conducted by the committee in order to:

a. review output from task 110-I, 200, 300 and 400,

b. gather other relevant information, and

c. complete output analysis from task 110-I, 200, 300 and 400.

Task 620-I accommodates all activities to set up a management plan and its implementation. The process is diagrammed in figure 3. In those of protected areas planning is accommodated in task 630-I and diagrammed in figure 4.

To finalize the work of division 600, in other words to have an integrated coastal area management scheme for Segara Anakan, task 640-I is implemented to accommodate the following activities:

a. designing flow charts showing linkages of all agencies and plans for integrated coordination of smaller issue (Segara Anakan issue oriented plans),

b. completing map of Segara Anakan and site specific management area,

c. formulating how various plans will be coordinated and implemented,

d. forming a working committee, and

e. communicating the results of the planning process through a series of seminars.

2.4.7. Discussion on Planning and Procedure.

Aprilani. Segara Anakan is strongly influenced by the Citanduy River. Planning should therefore take this aspect into consideration. As for back up information for division 600, the team could have more information, since a lot of studies have been conducted. The draft of the planning and goal formulation should be prepared in

advance. This draft could be adjusted later on as more data are made available although the current data is sufficient in developing management plans.

Koesoebiono. Concerning back-up data mentioned by Aprilani, I realize that a lot information exists but my team at the moment has very limited access to the references available. In this regard, the team has proposed that division 600 be tasked with collecting data and information for matters of planning.

Purwito. Supporting Aprilani, it is possible to have a plan prepared as early as possible. The plan can also be considered as a guide for PI's to change their work plan for 1988. It is certain that much information for the benefit of our Project has been gathered by the Citanduy River Project. In this connection, having Sunarno as a member of NSC will facilitate the progress of the Project. Ali Rahman, as a member of the Steering Committee of Citanduy River Project and also Head of Agriculture and Irrigation Divison in Bappenas, should also be informed about the Project for it to have a formal back up from the government.

White. Since the Citanduy River Project has done useful studies having Sunarno as a member of NSC is necessary. Coordination between the two Projects should also be strengthened in other ways such as through the Department of Water Resources Management of Ministry of Public Work in Jakarta as well.

Aprilani. In response to Suprapto's presentation, the Project will not ignore the local people, since they are the target of development. Panikel inhabitants themselves should intend to change their way of life as their living environment is being changed ecologically. The scientists can recommend development planning for the area but whether the area will be maintained as it is now and whether only canals will be left is not yet known.

Riyadi. The Segara Anakan problem is not only a problem of the coastal area, but also a problem of land management. As a result, management applied must also extend to regional planning. Such planning can only be established with interdepartmental coordination.

Purwito. Weak coordination is considered as a chronic problem of developing countries. The type of government also affects the problem of coordination. In the case of Indonesia, in which the Central Government is very strong, the local governments are having difficulties in developing their local areas. sectoral development also dominates the planning strategy. In other words,

each Department possesses a programme that may overlap with each other. This condition and especially the coordination between Central and Provincial governments should be looked into by the Legal/Institutional task. Apart from these weaknesses, Bappeda has now received more authorization than before.

Husein. What will be planned for not been clearly stated. Planning should consider the following aspects:

- effect of productivity,
- stability,
- sustainability, and
- equity.

Trade should also be considered. In connection with planning, a general land use zonation scheme is necessary.

Koesoebiono. Division 600 is intended to devise a zonation plan for the land and water areas.

Purwito. Division 600 is very important. This task will accommodate all recommendations by the other tasks. The task may also redirect the work of the other research tasks to fill in data gaps. Also for proper planning, consultation with the local government and non-government organizations is will be critical.

Husein. Careful actions in consulting different groups are needed, since different views or perspectives exist.

Nurzali. Who will implement such a plan or strategy once established? This question should be considered by the Legal/Institution group as an important output.

Chua. To establish a plan the objectives must be clear. Implementation of the plan will be accommodated in many activities. Planning will incorporate the sustainability of the resources at hand. Acceptance by high level decision makers of such a plan is also very important. In addition, plan implementation must have a firm duration.

Kasijan. Good communication is necessary among project members in sharing data and information for an effective plan. In this regard the Project Secretariat can be of service.

White. Planning for Segara Anakan will necessarily involve both the CRM project team, researchers and the local national agencies responsible for implementation. Along this line good communications and sharing of ideas are needed so that the plan reflects the various

perspectives and interests represented. The local villages should not be exempt from this process and the practical findings on alternative livelihoods should also be included.

2.5.1. Special Presentations.
Chaired by Alan White.

2.5.1.1. Development of fishermen village in Kampung Laut, Segara Anakan-Cilacap, by Riyadi Yoedodibroto and Martayadi.

The study aims to improve public facilities and housing of the village and develop new settlements. Findings of the study include socio-economic status, public health, land use and type of settlement.

Discussed in the study are problems of environment and settlement which are divided into physical and non-physical. Physical problems deal mainly with those of surface water area for fishing, mangrove cutting, poor drainage and unstable land. Non-physical problems pertain to the people's reluctance to consider change as well as passive participation in development.

The development strategy put forward in the study focuses on manpower, water resources, nature resources, and settlements. The type of houses in the village and the site plan are presented in diagrams.

2.5.1.2. Management of environmental protection in Pertamina refinery, Cilacap by Daniel Malonda.

Pertamina's effort to protect environment was realized by establishing Badan Koordinasi Lindungan Lingkungan (BKKL) or Coordinative Body of Environment Protection in 7 June 1973. In Cilacap Exploitation Unit IV the activity of environment protection covers:

1. Land and ground water quality,
2. Surface water quality,
3. Air quality,
4. Noise reduction,
5. Replanting and reforestation of mangrove forests, and
6. Management of public structures and infrastructure.

The main goal of those activities are emphasized in:

1. Providing the industrial area as a secure, healthy and convenient working area,

2. Keeping the surrounding area away from the disturbances caused by Pertamina's activity and

3. Protecting water used in agriculture and fisheries.

Cilacap was chosen as a site for the oil refinery because:

1. A high number of consumers is concentrated in Java Island,

2. Cilacap has an ideal harbour, and distribution pipees have been constructed in adjacent areas,

3. The government has set a plan for Cilacap as an industrial area, and

4. The area and land comes as support needed in constructing oil bunkers.

Pertamina works along two main basic functions:

1. to carry out oil exploration for the benefit of the Indonesian people and to provide the Indonesian people with their oil needs, and

2. to carry out transfer of technology.

These functions are implemented with 4 principles, i.e., safety, security, healthy and environment protection.

For the attainment of the fourth principle, Pertamina equips its facilities with 6 environmental protection tools, namely the water strippers, corrugated plate interceptor, holding basin, stack, silencer, and fin fan cooler.

2.5.1.3 Citanduy River Project, by Sunarno.

The Project was established after a big flood occurred in 1968. The government was then constructing a levy to prevent yearly floods. In 1972, a loan from USAID was given to the government. This loan was directed to set up an irrigation rehabilitation programme. The Project was continued, and in 1975 a first review plan was made. This review highlighted 5 main issues, i.e., levy construction for prevention of floods for 25 years, irrigation rehabilitation, new irrigation development, upland conservation, and Segara Anakan. To carry out such a plan, the government asked for another loan from ADB in 1980. A second

review plan was carried out in 1985, with emphasis on the development of an irrigation scheme, development of drainage for Segara Anakan, development of an optimal use plan for Segara Anakan and construction of dam and reservoir. This plan was supported by an ADB loan that was received by the government in 1987 and the coming year of 1989.

During the Project, some findings were gathered. They mostly address the sedimentation problem. Annual sedimentation inflow to Segara Anakan is estimated to be around 5 to 10 million ton. 2.5 million ton stays in the lagoon, 2 million ton from Citanduy Rivers. Annual freshwater inflow is estimated from 3 main sources, i.e., Citanduy River (3,500 million m^3), Segara Anakan (1,700 million m^3), and rainfall (67 million m^3). In terms of salt water, the lagoon receives 26 million m^3 during spring tide and 10 million m^3 during neap tide. Around 25 million m^3 of sand is deposited on the western outlet of the lagoon.

With regard to the sedimentation process in the lagoon, the water surface area has been reduced from 6,400 ha in 1900 to 2,700 ha in 1986. With the current sedimentation rate the lagoon is estimated to have little or no surface water at all by the year 2000. In response, the Project has raised 9 alternative plans for Segara Anakan which are grouped in 3. These are described as follows:

1. Limited change of the lagoon.

   - agitation dredging,
   - conventional dredging, and
   - enhanced flushing.

2. Alternative to the Citanduy River.

   - diversion of Citanduy River,
   - diversion of Citanduy and western outlet, and
   - upstream dams.

3. Closure of the lagoon.

   - partial closure,
   - full closure, and
   - barrage at western and eastern outlets.

Of these alternative plans, the Project will only consider 4 alternatives, namely:

1. Agitation dredging, estimated to cost US$10 million,

2. Conventional dredging, estimated to cost US$16 million,

3. Enhanced flushing, estimated to cost US$23 million, and

4. Double barrage, estimated to cost US$56 million.

2.5.1.4. Research Group on Agroecosystem, by Ibrahim Manwan.

The research group was established in 1984, after a Workshop, funded by Agency for Agricultural Research and Development and Ford Foundation, had been conducted in Bogor. On the topic "Success in Agriculture Intensification and Implication on Environment," this Workshop was attended by 25 selected participants. Each participant was invited based on his/her personal capability and not because he/she represented any institution.

The major programmes touched on by the research group were:

1. Critical uplands in Java,
2. Critical upland (semi arid) in East Lesser Sunda,
3. Swampy lands,
4. Coastal area of Java and south Sulawesi, and
5. "Supra insus" or the rice intensification programmes.

To do such research, the group applies 3 different approaches: agroecosystem analysis, system analysis, and rapid rural appraisal. The strategic approach is typology. Most research has been completed, and 5 proceedings have been published.

To shed light on the systems, the group worked out and presented a model of coastal resources management systems. The interaction between the system and the resources affected is illustrated in figure 5.

3. Closing of the Workshop.

3.1. Remarks and Summary, by Alan White.

The Workshop was generally considered to be a success since there was lively discussion, many ideas were brought forward and much information from research tasks were presented. The main outputs from the Workshop were:

a. Synthesis of Biophysical data which focused on the need to:

   a.1. develop a land use zonation plan for management of mangroves and adjacent areas,

   a.2. evaluate further the lagoon as a nursery area for offshore fisheries,

   a.3. to make recommendations regarding the physical management of the lagoon based on the biological resources,

   a.4. to develop a fisheries management plan, and

   a.5. to set criteria for waterqualityin Segara Anakan.

b. Synthesis of Socio-Economic data which focused on the need to:

   b.1. evaluate alternative livelihood options,

   b.2. to make an economic evaluation of resources,

   b.3. to determine willingness of people to make changes,

   b.4. to look at local markets, and

   b.5. consider local organization.

c. Synthesis of Legal/Institutional data which focused on the need to:

   c.1. analyze the legal/institutional framework more completely for CRM implementation,

   c.2. highlight theinstitutional conflicts in land use and to suggest solutions, and

   c.3. to list all the laws affecting CRM and to highlight those for CRM in Cilacap.

d. Consideration for planning which included:

d.1. involving CRM Project Team and local agencies and the appropriate national agencies of forestry, fisheries, and population and environment,

d.2. forming a planning team headed by Koesoebiono, and

d.3. periodic meetings to promote the process and involvement of interset groups in the planning process.

3.2. Comments.

Several closing comments included:

Henk. There is now an understanding among PI's of what CRM goals are. The evaluation in economic terms of CR's will be important in the planning and decision making process. Socioeconomics is of prime importance in the case of Segara Anakan and that the perception of individuals in institutions will be important in planning. In this regard education is much needed.

White. The process of planning is important. It must include all the interest groups, otherwise the plan will only be a written document and nothing more. Planning is synonomous with a pre-implementation phase where conflicts are resolved. Key individuals in institutions both locally and nationally are important in this process.

Malonda. Pertamina would like to participate in future meetings and help in the plan formulation.

Chua. The participation has been active and useful and a management framework has evolved which we could follow for the duration of the CRM. We need to involve local agencies and finalize the research.

Appendices.

Appendix 1.

Agenda
Technical Workshop
ASEAN-US Coastal Resources Management
Indonesia In-Country Project
7 - 9 March 1988
Sky Garden Hotel Semarang

Date	Time	Programme
Day 1, Monday, 7 March 1988		**Registration and Opening**
	08.00 - 09.00	- Registration
	09.00 - 09.30	- Opening address by Dr. Purwito Martosubroto (National Steering Committee)
		Key notes by Dr.Aprilani Soegiarto (Chairman of Working Group on Marine Science)
		- Key notes by Dr. Chua Thia-Eng ASEAN-US CRM Project Coordinator
	09.30 - 09.45	- Introduction to Workshop objectives and format/ procedure by Dr. Alan White
	09.45 - 10.00	- Break
		Biophysical Presentations and Discussion **Chairman : Dr. Aprilani Soegiarto**

10.00 - 10.20	-	Assessment ofmangrove degradation and zoning for development/Task 210-I, by Soebagyo Soemodihardjo
10.20 - 10.40	-	Study of water quality of Segara Anakan and its adjacent waters/Task 220-I, by Kasijan Romimohtarto
10.40 - 11.00	-	Dynamics of water movement and sedimentation patterns of Cilacap/Segara Anakan Lagoon/Task 230-I, by Mulia Purba
11.00 - 11.20	-	Capture fisheries/Sub Task 241-I, by Nurzali Naamin
11.20 - 11.40	-	Lagoon and culture fisheries/Sub Task 242-I, by Edi Mulyadi Amin
11.40 - 12.00	-	Discussion on Biophysical
12.00 - 13.20	-	Lunch
		Socio-Economic and Legal/ Institution Presentation and Discussion, Chairman : Ir. Henk U., M.Sc. (Socio-Economic) and Dr. Chua Thia-Eng (Legal/Institutional)
13.20 - 13.40	-	Base line socio-economic survey/Task 320-I, by Budihardjo
13.40 - 14.00	-	Cultural survey on environmental CRM awareness in Cilacap Segara Anakan/ Task 420-I, by Winarno Yudho
14.00 - 14.20	-	Evaluation of perceptions and attitudes of public officers pertaining to environmental policy/CRM

		implementation/Task 420-I, by Agus Brotosusilo
14.20 - 14.40	-	Discussion on Socio-economic and Legal/Institutional Surveys
14.40 - 15.00	-	Break
		Special Presentations, Chairman : Dr. Alan White
15.00 - 15.20	-	Citanduy river project, by Soenarno
15.20 - 15.40	-	Research group on by Ibrahim Manwan agroecosystem (Keppas) by Ibrahim Manwan
15.40 - 16.00	-	Development of fishermen village in Kampung Laut Segara Anakan-Cilacap, by Riyadi Yudodibroto
16.00 - 16.20	-	Management of environmental protection in Pertamina, Cilacap by Daniel Malonda
16.20 - 17.30	-	Floor discussion
17.30 - 19.30	-	Break for dinner
19.30 -	-	PI's meet to discuss annual workplan

Day 2,
Tuesday,
8 March 1988

CRM Planning and Procedure Presentation and Discussion, Chairman : Dr. Aprilani Soegiarto

08.00 - 08.30	-	Coastal resources management planning and procedure, by Purwito Martosubroto

	- Concept of CRM planning for Cilacap Segara Anakan, by Koesoebiono
08.30 - 08.50	- Approaches to CRM planning, by Henk Uktolseja
08.50 - 09.10	- Local development planning and procedure with special reference to CRM, by Henry Suparno
09.10 - 09.40	- Land acquisition (land tenure) for development in Cilacap area, by Soeprapto
09.40 - 10.00	- Break
10.00 - 12.00	- Four working group meet
12.00 - 13.30	- Lunch
13.30 - 15.30	- Four working groups meet
15.30 - 15.45	- Break
15.45 - 17.30	- Four working groups meet and complete task

Day 3,
Wednesday,
9 March 1988

Plennary Session, Group Report and Recommendation, Chairman : Dr. ALan White

08.00 - 10.00	- Report of groups I and II and discussion
10.00 - 10.15	- Break
10.15 - 12.00	- Report of groups III and IV and discussion
12.00 - 13.30	- Lunch
13.30 - 14.30	- General discussion and summary of group results (Plennary session)
14.30 - 15.00	- Closing remarks by

		Dr. Chua Thia-Eng and Dr. Purwito Martosubroto
15.00 - 15.30	-	Break
15.30 - 16.00	-	NSC and PI's meet

Appendix 2.

List of Participants
Technical Workshop
ASEAN-US Coastal Resources Management
Indonesia In-Country Project
7 - 9 March 1988
Sky Garden Hotel Semarang

No.	Name	Institutions
1.	Dr. Chua Thia-Eng	ICLARM, Manila
2.	Dr. Alan T. White	ICLARM, Manila
3.	Dr. Aprilani Soegiarto	Indonesian Institute of Sciences, Jakarta
4.	Dr. Kasijan Romimohtarto	P3O, Indonesian Institute of Sciences, Jakarta
5	Dr. Soebagjo Soemodihardjo	P3O, Indonesia Institute of Sciences, Jakarta
6.	Dr. Purwito Martosubroto	Directorate General of Fisheries, Jakarta
7.	Dikdik Sodikin, DFM	Directorate General of Fisheries
8.	Ir. Sutomo Kusbandi	Directorate General of Fisheries
9.	Dr. Nurzali Naamin	Research Institute for Marine Fisheries, Jakarta
10.	Drs. Budihardjo	Research Institute for Marine Fisheries, Jakarta
11.	Ir. Edi Mulyadi Amin	Research Institute for Marine Fisheries, Jakarta
12.	Ir. Henk Uktolseja, M.Sc.	Office State Ministry for Population and Environment, Jakarta
13.	Koesoebiono, M.Sc.	Centre for Environmental Research, Bogor Agricultural University, Bogor

14.	Dr. Mulia Purba	Fisheries Faculty, Bogor Agricultural University, University, Bogor
15.	Ir. Riyadi Yudodibroto	Marine Research Study Group, Bandung Institute of Technology, Bandung
16.	Winarno Yudho, S.H., MA.	University of Indonesia, Jakarta
17.	Agus Brotosusilo, S.H.	University of Indonesia, Jakarta
18.	Heri Tjandrasari, S.H.	University of Indonesia, Jakarta
19.	Drs. Sunarto Hardjosuwarno	Gajah Mada University, Jogyakarta
20.	Drs. Edi Santosa, SU.	Office of Environmental Study, Diponegoro University, Semarang
21.	Drs.Sanusi Martodigdo	Centre for Environmental Study, Soedirman University, Purwokerto
22.	Ir. Soenarno, Dipl. HE.	Citanduy River Project, Banjar
23.	Ir. Djoko Subarkah	Citanduy River Project, Banjar
24.	Ir. Sukotjo Adisukresno	Fisheries Province Office, Semarang
25.	Ir. Djoko Setiadjit	Fisheries Province Office, Semarang
26.	Ir. Tojib Samihardjo	Fisheries District Office, Cilacap
27.	Ir. Sri Wantani	Provincial Development Planning Board, Semarang
28.	Ir. A. Hamam	Provincial Development Planning Board, Semarang
29.	Ir. Anton P.L. Triasto	District Development Planning Board, Cilacap
30.	Ir. Soeprapto	Land Use Office, Cilacap

31.	Dr. Ir. Ibrahim Manwan	Research Group on Agroecosystem, Bogor
32.	Drs. M. Husein Sawit, M.Sc.	Research Group on Agroecosystem, Bogor
33.	Ir. Djoko Santoso Hadi	Office of Environmental Study, Bogor
34.	Ir. Agustinus Winanto Taufik	Directorate of Forest Protection and Nature Conservation, Bogor
35.	Capt.Daniel Malonda	Pertamina, Cilacap
36.	Ir. Robert Naibaho	Pertamina, Cilacap