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BACKGROUND

Sea-sand mining is one of the biggest exploitation and exploration of marine resources activities in Indonesia, especially in Riau Province. Riau exports sea-sand around 180,000 cubic metres daily to Singapore and sea sand is one of major export commodities from Riau.

According to some studies, the negative impact of sea-sand mining activity to coastal ecosystems was found to be higher than the positive benefits. In addition, existing data about the condition of coastal ecosystems in the mining area is very important to be fully understood in order to measure the impact of mining activities in the region.

Bintan Island is one of the areas in Riau where sea sand mining has not yet been done, therefore the existing condition of its coastal ecosystems is very important for us to study in order to be compared to other areas which are heavily mined and to see the changes in the ecosystem after the mining activity started.

METHODS**Literature study and secondary data collection**

Literatures about coastal ecosystems in Bintan Island were collected from various sources, such as Riau University and COREMAP Riau. AMDAL documents about sea-sand mining activities in Bintan Island were also collected from some of the mining companies.

Field Survey

Field survey was conducted from July to September 2003. Geology, Coastal Geomorphology, Oceanography, Mangrove, Seagrass, Seagrass fishes, Coral Reef, and Socio-economic surveys were done in Gunung Kijang and Bintan Timur district.

RESULT**Geology**

There are two types of lithology in Bintan Island: igneous rock and sedimentary rock. The igneous rock was granite that lies on Penyusuk Island and Tanjung Kelun. The sedimentary rock was clastical sandstone and organic sandstone that lies on Ajab Island. Structural geology in Bintan Island is joint and minor deformation in quartz mineral. General direction of joint on Penyusuk Island is $\sigma_1 = U 57^\circ T / 69^\circ$ identified as Oblique Faults, on Teluk Bakau Bay is $\sigma_1 = U 30^\circ T / 4^\circ$ identified as normal faults and on Tanjung Kelun is $\sigma_1 = U 180^\circ T / 82^\circ$ identified as Reversed Fault. Rock resistance is poor due to joint intensity and highly deformed mineral contained in rocks. Economic minerals that have been mined on Bintan Island are bauxite, granite and land sand. Geological condition was found to be highly affected if the sea-sand mining exploitation were done. This condition is related to poor rock resistance that accelerates the process of beach abrasion and underwater morphology destruction.

**Coastal Geomorphology**

Beach structure in Bintan Island consists of three types: rocky beach, sandy beach, and mangrove beach. Rocky Beach was found in Penyusuk Island, Kerapu Island, Balau Island, Kerengge Island and Payung Island. Sandy Beach was found in Rusa Island, Kambat Island, Ajab Island, Beralas Pasir Island, and Siulung Island. Mangrove Forest Beach was found in Dendang Island, Mana Island, Ngalih Island, Bulat Island, and Beralas Bakau Island.



Rocky Beach was formed through the tectonic process and composed by granite rock and made it resistant against sand mining. The Sandy Beach is composed by mud and sand which resulted form hydraulic proceses and made it very susceptible to sand-mining.

Oceanography

Current simulation shows that current in the souththern part of Eastern Bintan waters is more dynamic than the north. This condition happens due to the difference of sea level elevation in southern part of Eastern Bintan waters is

relatively large. Physical parametric condition (turbidity: 0.2-3.3 NTU, sedimentation rate: 0.001240089-0.005557888 gr/cm²/hour) shows that the area was not polluted because there are no mining activities. However we would likely to see sudden change in Bathymetric condition which in return affects current and wave patterns when sea-sand mining activity takes place continually in northern part of East Bintan and the surrounding areas.

Mangrove

50 species of mangroves from 27 families was collected, and consist from 12 species of true mangrove and 38 species of false mangrove.



The Mangrove formation vegetation was started with *Rhizophora mucronata* which also has the highest scientific value from true mangrove species. However, there are difference in mangrove zonation between Kijang Estuary (20-80 m) and Trikora Estuary (100m). Environmental change, especially in Kijang estuary, is one of the main cause of the degradation mangrove condition.

Seagrass

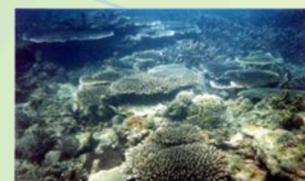
Eight species of seagrass: *Enhalus acoroides*, *Cymodocea rotundata*, *Cymodocea serrulata*, *Syringodium isoetifolium*, *Thalassia hemprinchii*, *Halodule uninervis*, *Halophila ovalis*, and *Thalassodendron siliatum*, were found in Bintan Island. In general, seagrass in Gunung Kijang district is better than in Bintan Timur. Based on field observation some seagrass biota have high economical value such as Siganiids fish (*Siganus canaliculatus*), mollusk (*Strombus* spp.), tiger prawn (*Penaeus monodon*), and swimming crab (*Portunus pelagicus*).

Seagrass fish

33 fish species from 22 families were found in Bintan Island. Some species are economically important species such as snapper (*Lutjanus* sp, *Lethrinus* harak), eels (*Moraena* sp.), siganiids (*Siganus canaliculatus*), flat fish (*Pardochirus pavoninus*), and barracuda (*Sphyraena jelo*). In addition to seahorse (*Hippocampus kuda*) that has been used as an ingredient in traditional medicine. This fact shown that seagrass beds have major role in fishery activity.

Coral Reef

The condition of coral reef in Bintan Island is ranging from very disturbed to good. Coral reef in good condition is found in Gunung Kijang district. However, the conditions of coral reefs in Bintan Timur district are showing degradation. High turbidity and sedimentation is one of the factors affected the coral reefs condition in Bintan Timur. The damaging effects which were mainly caused by heavily use Explosive agents are also to be considered as well.

**Socio-economic**

In general from the economic point of view, village people in the coast of East Bintan and Gunung Kijang district are living in a good condition. Most of them have their own permanent and semi permanent house.

Sea-sand mining plan in Bintan Island is a sensitive issue in the community. This condition happened because of the negative impact of mining activity that has been going on in other places (Karimun Island). Most of the villagers rejected the sea-sand mining activity in Bintan Island because of most of them are fishermen; hence they worried about the impact of mining activities to their catches.

If mining activity in the area is to be done, local people should be involved from the early stages and informed well in advance to avoid any problems that might happened in the future.

