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REVIEW:

Social and Environmental Issues of Danau Sentarum National Park, West Kalimantan

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ABSTRACT

Danau Sentarum National Park (DSNP) is a cluster of lakes located in Kapuas Hulu District, West Kalimantan Province with the total area of 132,000 ha. From 1981 to January 1999 this site was recognized as Suaka Margasatwa Danau Sentarum (Danau Sentarum Wildlife Reserve). Since 1994 this site had been declared as Ramsar site. DSNP is a "monumental site", since the only undisturbed peat swamp forest was found in this site. Peat swamp forest in the national park stores the oldest tropical peat in the world. The lakes and the peat swamp forest in DSNP that always flood is the biggest water reservoir for West Kalimantan Province. Peat swamp forest in the national park served as water reservoir in the national park, which was able to keep 300 – 400 % of moisture content from dry weight basis. Based on our investigation, the decreasing income of fisherman and natural resources destruction affected other community to do illegal logging supported by investors from neighboring country in which they can get cash money easily. Using special approaches in law enforcement, technological, socio-economical, socio cultural and ecological aspects should solve social problems faced by DSNP. Eco-tourism might be one alternative solution for DSNP as one of tourism object.

Key words: Danau Sentarum National Park, West Kalimantan, social issues, environmental issues.

INTRODUCTION

Danau Sentarum National Park (DSNP) is a cluster of lakes located about 700 km from Kapuas River in Kapuas Hulu District, West Kalimantan Province (Anshari et al., 2002). Based on the decree of Ministry of Forestry and Estate No. 34/Kpts – II/1999 dated 4 February 1999, the Lake Sentarum was declared as National Park with the total area of 132,000 ha. From 1981 to January 1999 this site was recognized as Suaka Margasatwa Danau Sentarum (Danau Sentarum Wildlife Reserve) based on the decree of Directorate General of Forestry, No. 2240/DJ/1981 (Anshari et al., 2002). Furthermore, since 1994 this site had been declared as Ramsar site (D'Cruz and O'Callaghan, 1994, Giesen, 1995a, 1995b, 1996; Anshari et al., 2002). The lakes in DSNP are in open areas and influenced by monsoonal condition. The water level may reach 12 meter deep in rainy season and decrease in dry season. When water level in Kapuas River decreases, water will flow from the lake to the river. On the other hand, the Natural Park may gradually dry especially during long dry season (Giesen, 1987, 1995a, 1995b, 1996, Jansen et al., 1994, Jeanes, 1996, 1997, Jeanes and Meijaard, 2000; Anshari et al., 2002) (Figure 1). Therefore, flora, fauna and human activities have been adapted to the tidal pattern of the lakes in DSNP. Recorded data shows that DSNP is a "monumental site", since the only undisturbed peat swamp forest was found in this site. Anshari et al. (2001) reported that peat swamp forest in the national park stores the oldest tropical peat in the world. Peat found in the beach (marine) is originated from mangrove, while peat swamp forest found in the lakes of the National Park is predicted come from heath ('kerangas') vegetation.

The lakes and the peat swamp forest in DSNP that always flood is the biggest water reservoir for West Kalimantan Province. During rainy season, the exceeding water flow from rainfall is hold by the National Park, so that Kapuas River is not flooding. On the other hand, when water level of Kapuas River tend to decrease during dry season, water from the national park flows to the river and make a balance of the river debit.

Recently, climate changes globally, which may cause longer dry season that leads to global warming in the future. During the last ten years, DSNP experienced three times of dry season in the period of 1994 and 2001. In the year 2002, water level of the lakes fluctuated highly in which water level decreased in early June and increased in July, then decreased in August (Anshari et al., 2002). Normally, there is one to three dry month's period in the lakes of DSNP. However, the lakes experienced seven dry months period in 1997 (Jeanes and Meijaard, 2000; Anshari et al., 2002). The increase of dry period may be influenced by

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climate change and human activity surrounding and in the area of DSNP. Environmental destruction and the lost of forest in West Kalimantan may cause high surface run off which lead to highly fluctuated of water level in Kapuas River. Kapuas River increases and tends to over flow during rainy season; meanwhile the water level may decrease rapidly when rainfall decreases.

A

B

Figure 1. Lake *Tapak Luar*, one of the lakes in DSNP with the background of Semujan hill in two seasons: (A) rainy season (December 2003, Photo by Bambang Hero Saharjo), and (B) dry season (June 2004, Photo by Onrizal)

SOCIAL ISSUES

DSNP area has socio economic and culture values related with the life and activities of local community who live in and surrounding the area. Therefore, those values need to be taken into account in DSNP management by policy makers. Recorded data showed that about 1800 household (9000 people) stay in DSNP whereby most of their income depends on the natural resources sustainability of the park. They are consisted of "Melayu" (Malay) communities who stay near the river and lakes and "Dayak Iban" communities who live near the forest area in the park (Anshari et al., 2002).

Malay communities dominate the area in which about 80% of them live in the park. Most of the people are "nelayan" (fisherman) (Giesen, 1987, Jansen et al., 1994; Anshari et al.,2002). They constitute a group and establish a village ("kampong") in the National Park. Some of them stay in permanent or semi permanent houses and some of them still stay in "lanting" (floating house) on the river site and lake. In addition to the local people living in the park, some other people also come to DSNP periodically. The local people informed that they normally come in fishing time during dry season when the water level of the lake decreases, in the period of June to August.

Each village has their own working area that has been agreed upon by the community. A leader of the fisherman who is selected through local agreement arranges fishing activities**.** The agreement varies from one village to another (Anshari et al., 2002). However, it is cleared that the differences of opinion among the villages seem not to be a serious problem so far.

Fisherman community in DSNP does not depend only on fishing activities but they also grow fish in a "keramba" (a basket put in the stream) in their village (Anshari et al., 2002). Fish species grown in "keramba" are *Channa micropeltes*, *Leptobarbus hoevenii*, *Oxyleotris marmorata*, *Pangasius nasutus*. *C. micropeltes* and *O. marmorata* are carnivores consuming small fish. They are kept in the "keramba" for at least one year. To grow fish in "keramba" has been intensively carried out and large number of small fishes has been capture to feed the fish. This activity may affect fish population in the park.

Based on our observation, agricultural activities in DSNP are relatively in a small scale. Those activities are traditionally implemented by most of "Dayak" communities by doing shifting cultivation on hillside around the forest area. Main agricultural commodity is rice. Beside corn, sweet potato and horticulture commodities are also planted. Fruit trees are normally planted around their village. Beside agriculture practices, "Dayak" community is also doing hunting of turtle and other animals. On the other hand, since the access to Malaysia is relatively near, the local people informed that many young people leave their village and go for work in Malaysia.

From September to February in each year, some people in DSNP are busy with many activities dealing with honeybee harvesting. During that period wild honeybees (*Apis dorsata*) move to DSNP. It is correspond to the flower season of forest trees in the park. The communities living in the national park know traditional method how to keep the wild honeybee. They used a kind of wood for a nest that locally called "tikung". One beekeeper has about 40 – 60 "tikung", some of them have around 100, and others have no "tikung". One "tikung" which is kept intensively may produce around 10 – 20 kg honey (Anshari et al., 2002, LSM Riak Bumi, 2003).

The regulations applied in DSNP are originated from traditional custom. These rules are maintained by the community in order to manage their life in the park. The**ir ancestor had executed the agreements** for years. Recently, however, new values had been established based on agreement. The lost of income of the fisherman due to the decrease of water resources quality affect the lost of chance for the community to participate in sustainability activity for DSNP management. On the other hand, based on our investigation, the decreasing income of fisherman and natural resources destruction affected other community to do illegal logging sponsored by investors from neighboring country in which they can get cash money easily. The investor usually called "cukong" that sometime caused horizontal conflict between party who really want to protect the national park and another party who really want to join the investor.

Using special approaches in law enforcement, technological, socio-economical, socio cultural and ecological aspects should solve social problems faced by DSNP. Problems in DSNP are multidimensional in motive. Furthermore, land clearing and land preparation by slash-and-burn method in the buffer zone area may cause a negative impact on the national park ecosystem.

ENVIRONMENTAL ISSUES

Environmental quality degradation

Recently, DSNP is facing environmental problems, which lead to land degradation due to high exploitation activity in the forest in and around the National Park, particularly during wet season. The intensive fishing activity and growing fish in "keramba" had been found to decrease fish population in Kapuas River which leads to difficulties in finding fish during wet season. Logging and land clearing activities in and around the national park have caused negative impacts to the water quality of the lakes in DSNP. As natural resources of water and forest exploitation in and around the national park increases, the transportation and the migration of people to the national park has also increased significantly.

Accessibility for people going through the national park has increased since there was a change of availability of transportation and other facilities. Transportation services from outside DSNP to villages in the lakes that normally by "motor Bandung" have changed to speedboat. Using speedboat will spend only 2-3 hours from Semitau (village in outside DSNP) to Semangit (one of the village in DSNP), while using "motor Bandung" needs 3-4 times longer. Recently, "motor Bandung" is not operated regularly, because the people prefer to use speedboat for daily transportation. Condition around DSNP has rapidly changed, especially in buffer zone between Lanjak and Badau.

Based on our observation, located as a district border, Badau become a transit city, which is noisy and grows rapidly. Economic activities seem starting to grow up in this area, marked by the development of supermarkets and hotels. Those changes also accompanied by negative social impacts such as gambling, drug abuse and prostitution. Next to Badau, Lanjak is a strategic sub-district located between Putussibau and Badau. Lanjak is the final destination for logging or sawn timber transportation before entering Indonesia-Malaysian border and recognized as one of the biggest route for illegal logging in West Kalimantan.

Decreasing of fish population

Fish population in DSNP is decreasing due to human activities mostly, like using equipment and other fishing facilities, which cause negative impacts to the fish sustainability in Kapuas catchment's area. Using poison called "bubu warin", strum technique in several places, chemical poisoning, and cut pond have caused bad impacts since those things decrease the chance for fish population to grow up (Anshari et al., 2002).

Fishing baby fish in DSNP is strongly related to the activity of growing fish in "keramba", especially "toman" species. The baby fishes from various species are being captured and used as food for "toman". This causes disturbance of population's in DSNP. Anshari et al. (2002) reported that the activity had been done for at least 10 year and seemed to create negative impacts. Most fishermen feel that fish population in the lakes, including baby fish, decreased year by year. A strong impact to the economical performance seems to be experienced by people dealing with the fish business including fisherman. From fish biodiversity point of view, scarcity of certain species had been found such as the exporting fishes of *Scleropages formosus* (arowana), *Botia macracanthus* (ulang uli), and *Oxyeleotris marmorata*, some species even becoming disappeared such as *Balantiocheilos meloptrus, Neobarynotus microlepis, Maerochirichthys maerochirus.*

Decline of water quality

Decline of water quality in DSNP is not only due to human activities in the park but also surround the park, especially northern part of the buffer zone. It is due to the intensively opening access to Badau especially to the neighboring country by which forest resources exploitation has been increased in Kapuas Hulu district. Logging activities in water catchments area around DSNP effect directly to the hydrological balance in the national park area.

The increasing number of water transportation activities across the lakes of the national park has also negative impacts to water quality such as gasoline and wood chemical substances used in the exploitation. Forest resources exploitation which focuses on logging often ignores conservation aspect. Although it might not be a permanent business, certainly causes forest destruction. This lead to difficulties in natural regeneration and increase of fire risk. The forest is also treated with erosion and flood which lead to soil degradation. Eroded soil layer may increase the particle entering water body which finally shallower the lakes and Kapuas river.

Natural forest stands closed to DSNP with their richness of biodiversity have been functionally changed when a company replaced the stand with oil palm plantation (Anshari et al., 2002). Furthermore, local people are still applying slash and burn method for agricultural activity which consist of cutting, drying and burning trees. Meanwhile, rubber and pepper are being planted as agricultural estate crop. The alteration of Dipterocarps forest is strictly affect water balance in DSNP.

Fluctuation of lake's water level

The fluctuation of lake's water level is periodically change and depends on the condition of water catchments area around the national park. The water level in the national park is highly influenced by rainfall, surface run-off and the ability of peat swamp forest to store the water. The rainfall and surface run-off seem to be directly affected by canopy cover and the condition of natural forest near the national park. Klepper (1994) reported that peat swamp forest in the national park served as water reservoir in the national park, which was able to keep 300 – 400 % of moisture content from dry weight basis.

The alteration of hydrological pattern that occur in DSNP is highly related to the shifting of rainy and dry season and water level of the lakes. Nowadays, local people living in DSNP are finding difficulties in predicting the shifting period of rainy and dry season. This problem may affect seasonal calendar, which is very important in scheduling of fishing period. Without proper seasonal calendar, fishing activity may be disturbed and affect their income directly.

Forest and land fires

Forest and land fires often occur in DSNP. Based on pollen analysis and coal analysis data, peat swamp forests in the national park have frequently experienced fires since 20.000 years ago (Anshari et al., 2002). Forest fire had been reported also by environmentalist and researcher who visited the lake of Kapuas in the last centuries. Recently, fire become more quite frequently occurs especially during dry season. Until nowadays, all fires which had occurred in the area were due to human activities.

According to pollen analysis by Anshari et al. (2001), fire occurred in the peat swamp forest area had not destroyed the habitat and neither caused disappearing of trees formation. About 1.400 years ago, forest fire tended to improve trees formation and affect the changing of closed forest to become open forest (Table 1). Nowadays, fires become a very serious problem.

Table 1. Predicted burned area in the DSNP in the period of 1973-1997 (Anshari et al., 2002).

Year	Burned area (ha)
1973	5483
1990	9045
1994	11105
1997	18905

Forest and land fires occurred in DSNP is closely related to human activity, including their motivation in expanding of fishing area. During dry season, thousand of people from village around Kapuas River come for fishing. Therefore, the activities during that time are very intensive.

Negative impact of the fires is the alteration of forest structure and composition. Frequent fire occurrences may increase the chance of this area become cogon ("alang-alang") grassland (Saharjo et al., 2004). Anshari et al. (2002) informed that several wildlife such as *Pongo pygmaeus* ("orang utan") and *Nasalis lavartus* ("bekantan") were forced to move to the unburned area in which plenty of foods are available. Fires in 1997 caused wild bee of *Apis dorsata* stop building their nest in DSNP since haze/ smoke produced by burning disturbed their activities. Besides, the trees whereby the honeybees place their nest were burned out. This caused extreme (more than 90%) of decreasing of honey production during 1997 – 1999. However, the farmer could get the honey for daily need but not for sale.

Based on our investigation, the decreasing income of fisherman and natural resources destruction affected other community to do illegal logging supported by the investor from neighboring country in which they can get cash money easily

Biodiversity

One of the special natures of DSNP is the richness of flora and fauna (Saharjo et al*.,* 2004). Recorded data show that there are more than 500 trees species, 260 species of fish, 300 species of birds, 11 species of turtles and 3 species of crocodiles. Besides, the national park area is a habitat for *Pongo pygmaeus* (orang utan), *Hylobates muelleri* (siamang), *Nasalis lavartus* (bekantan), *Macaca fascicularis* (long tail monkey), *Helarctos malaganus* (honey bee), *Sus barbatus* (wild pig), some species of deer, snakes and lizards (Giesen, 1987, 1995a, 1996, Jansen et al., 1994; Jeanes and Meijaard, 2000).

Eco-tourism

An idea to create DSNP as a tourism object had been initiated since the park had the status as wildlife reserve in the period of 1994-1995 (Giesen, 1995a, 1995b, 1996, Jeanes and Meijaard, 2000). The idea appeared when the uniqueness and specific of DNSP have particular attention from domestic and also foreign tourists to come. Besides, since the national park had been recorded as one of Ramsar site in Indonesia, the national park is become more valuable to be "sold" for international community.

Several benefits that might be taken from DSNP as the tourism object are as follows (i) availability of fund for managing DSNP, (ii) creating job opportunities for the people living in and around the park, (iii) reducing natural resources exploitation pressure on DSNP by local people, (iv) being a source of income for Kapuas Hulu District. However, establishment of DSNP as one of tourism object probably will cause several negative impacts as follows (i) decreasing of environmental quality, (ii) destruction of ecological condition, (iii) economical dependent, (iv) negative changing of socio cultural condition.

Eco-tourism might be one alternative solution for DSNP as one of tourism object. Unfortunately, the word is easily said but not in implementation, because it cannot be run amateur but it must be conducted professionally. One important thing is that opening the protected area to be an open access area must be carefully considered and should be done through an integrated study.

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