

Mangrove Forest and Charcoal Production: Case of Batu Ampar, West Kalimantan

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Abstract

Mangrove is a coastal habitat that is found in tropical and sub-tropical tidal areas, but has been undervalued in the past and consequently subject to extensive removal and degradation. Conversion of mangrove forests into other alternative uses is happening in many parts of the world, including Indonesia. Despite the fact that degradation of mangrove forest is growing, the Batu Ampar mangrove biosphere remains relatively intact and good.

This paper seeks to examine the underlying factors explaining the relatively good condition of mangrove in Batu Ampar, West Kalimantan. It is based on empirical study in Batu Ampar village that is part of the Batu Ampar mangrove biosphere. The research focuses on the human-nature interactions to mangrove ecosystem in Batu Ampar and is examined based on national political situation in Indonesia that can be distinguished between before and after the reform era. The community of Batu Ampar village depends directly and indirectly on the mangrove ecosystem resources with the majority of villagers being fishermen and charcoal producers. Their interactions with mangrove ecosystem are dynamic and affected by internal and external institutions. Since 2007, local charcoal production has been on rising, and careful attention to the sustainability of mangrove forest must be given. However, this research shows that charcoal production in Batu Ampar village can actually help to prevent the conversion of mangroves into alternative uses.

Key words: *mangrove ecosystem, charcoal, human institution, natural resource management.*

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INTRODUCTION

The archipelago of Indonesia contains one of the largest areas of mangroves in the world. Mangroves are widespread along the coast of Indonesia. They are found along the eastern shore of Sumatra, the western and eastern shores of Kalimantan, the western and southern shores of West Papua, and the shores of the Aru islands, with limited other areas in south-eastern Sulawesi and along the northern shore of Java. The estimates on the status and extent of Indonesian mangrove vary. Giesen (1993) presented that the remaining Indonesian mangrove areas is 2,490,185 ha, while World Resources Institute (2000) calculated 2,423,700 ha (Wilkie and Fortuna 2003).

Conversion, from mangrove forests to shrimp or fishponds, is still a problem in areas where there is very low awareness by relevant parties on legislation and management of the mangrove ecosystem. FAO estimates that a quarter of the world's mangrove has been lost over the last twenty years although the rate of loss during the 1990s (1 percent per annum) is down from the 1980's rate of 2 percent per annum. Based on FAO data in 2003, the rate of mangrove loss in Indonesia is 1.8 percent per annum (UNEP 2004).

Mangrove loss in Indonesia occurs in North Sumatra, Lampung (southern part of Sumatra), northern part of Java, and East Kalimantan. Different from other areas in Indonesia, the mangrove condition in Batu Ampar biosphere (West Kalimantan) is relatively intact. This research intends to examine the underlying factors explaining the relatively good condition of mangrove in Batu Ampar. We will focus on the human-nature interactions to mangrove ecosystem in Batu Ampar, especially human institutions.

SCOPE OF RESEARCH

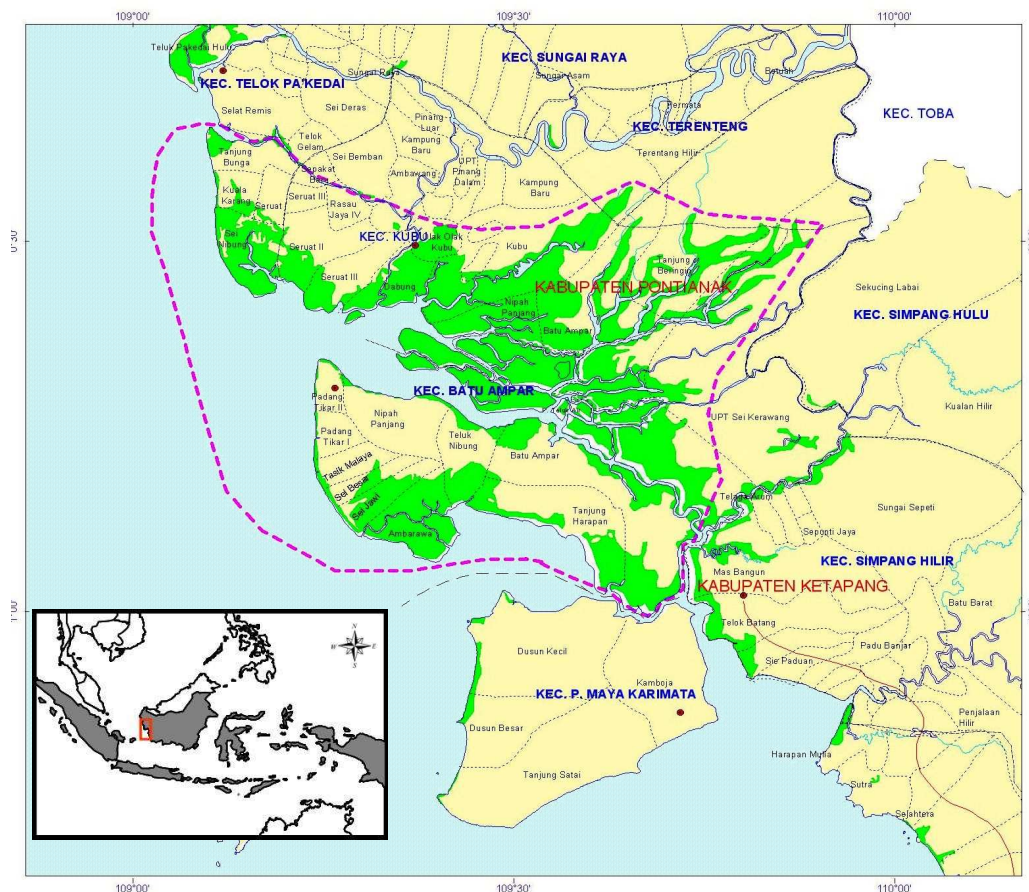
The research uses a framework for institutional analysis. It focuses on institutions governing resource use and its subsequent outcome on the condition of the resources (Dolšak and Ostrom 2003). In solving social dilemmas and conserving ecosystem goods and services, formal or informal rules are called for, to fulfill short-run costs for long-run societal gain (Rudd 2001). Institutions will shape incentives and actions taken by individuals.

This research was based on field research from December 2007 to February 2008, which contains qualitative approach. Data collection methods were field observation, in-depth interviews with key informants, which selected purposively, and literature studies.

This paper is started with describing the research settings that explain the condition of mangrove resources and socio-economic conditions in Batu Ampar mangrove biosphere that situated in 3 sub-districts and 20 villages. Subsequently, in depth analysis will focus on Batu Ampar village, particularly on mangrove charcoal production. The human-nature interactions to mangrove ecosystem in Batu Ampar are examined based on national political situation in Indonesia that can be distinguished between before and after the reform. The reform era was started when the New Order regime collapse and the Presidency of Soeharto ended in 1998. The national political situation gives impact to the resource use of mangrove forest in Batu Ampar, which particularly relates to different stakeholders involve directly and indirectly to the mangrove forest.

RESEARCH SETTINGS

Batu Ampar mangrove biosphere situated in Borneo in the administration of West Kalimantan Province. The mangrove biosphere lays in three sub-districts namely Batu Ampar, Kubu, and Teluk Pakedai, that situated in Kubu Raya District.⁶ Data in year 2007 shows that the area of Batu Ampar mangrove forest is 66,503 ha. Batu Ampar mangrove forest is a state forest and since 1982 and later renewed in 1992 and 2004, was enacted by government for area 33,401 ha as protected mangrove forest and 32,183 ha as production mangrove forest (IMReD 2007). The mangrove area is part of Forest Management Unit of Batu Ampar with total area of 1,408,125 ha. Towards the landward, Batu Ampar is covered by terrestrial forest. The area is part of river basin of Kapuas and Mendawah. Most rivers are used for transportation channel for passenger and for goods, as well as for fishing (Santoso 1998).



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Figure 1. Batu Ampar mangrove forest biosphere

Source: IMReD and UNEP (November 2007)

Batu Ampar Mangrove Resources

Mangrove vegetation in Batu Ampar area consists of an *Avicennia* sp. zone; *Sonneratia* sp. zone; mixed *Rhizophora apiculata* and *Bruguiera* sp. zone; mixed *Rhizophora* and *Nypa fruticans* zone; and *Nypa fruticans* monospecific stands. There are 21 true mangrove species and 17 associate mangrove species, including the endemic species (*Kandelia candel*). *Rhizophora* spp., *Bruguiera* spp. and *Nypa fruticans* are the dominant tree species covering most of the mangrove forest area extending further inland along the watercourses. The fauna identified from the Batu Ampar mangrove forest includes mammals, reptiles, birds and a wide diversity of aquatic fauna such as fish, crustacean, gastropods, bivalves, polychaetes, phytoplankton and zooplankton (UNEP and IMReD 2004).

Different zones or belts of mangroves may be distinguished from seaward to landward side. The first belt that located in the seaward margins, having thickness of 50-100 meters towards the landward, is dominated by *Avicennia* sp., *Sonneratia alba*, *Rhizophora mucronata*. These mangrove trees are usually used for building material. The second belt is dominated by *Rhizophora apiculata* and the third belt that situated towards landward is dominated by *Bruguiera gymnorhiza*. Type of trees that located in the last two zones is often extracted for charcoal production (IMReD 2007b).

Between year 2000 and 2007, the area of mangrove forest in West Kalimantan Province remains unchanged and even increased. Environmental Office of West Kalimantan studied the mangrove cover based on landsat imagery, which shows that total mangrove area was 129,641 ha in 2000 and increased into 137,445 ha in 2007 (Bappeda West Kalimantan Province 2006). On Batu Ampar itself, a study has done by IMReD (2007b) shows that mangrove forest was increased from 65,386 ha in 2005 to 66,503 in 2007. The increase is estimated due to natural sedimentation and natural regeneration of mangrove trees.

Socio-economic Conditions

The community of Batu Ampar, Kubu, and Teluk Pakedai sub-districts depends directly and indirectly on the mangrove forest resources with the majority of the population being farmers and fisher folks. In 2001 total population of Batu Ampar District were 35,068 people in 2001, Kubu District 32,955, and Teluk Pakedai District 20,474 people (UNEP and IMReD 2004). The total number of population in Batu Ampar village alone was 9,119 people.

Commercial terrestrial forest logging was once also of great importance to Batu Ampar's livelihood. A local logging concession was the sub-district's largest

employer and when the logging operation was closed by end of 1990s, many former employees became a local charcoal producer or fisher folks. Most fishers operate motorized or traditional boats and employ small-scale, mainly gill nets of various kinds, but also throw nets and drift nets.

BEFORE REFORM ERA

The direct uses of mangrove resources in Batu Ampar vary, from subsistence household use to commercial use by local people and private companies. In 1906, the colonial Dutch was estimated entering Batu Ampar and extracted mangrove for tannin production. Mangrove charcoal production was started to exist in Batu Ampar since 1913, which was initiated by the new comers of Chinese ethnic (IMReD 2007a). The mangrove timber has been extracted for subsistence use for house piles, wharfs and jetties. The leaves of nypa trees are used to build fish traps and house roofs (UNEP 2004).

The New Order period started when President of Soeharto took power in 1966. Forest resources became one of the primadona for national revenue and economic growth. The national government encouraged private logging concessions to exploit forest in many areas in Indonesia, including in West Kalimantan. Ecosystem of the Batu Ampar mangrove biosphere consists of mangrove ecosystem, tropical terrestrial forest, and swamp forest. Terrestrial and mangrove forests have contributed to the local livelihoods. Private logging companies in terrestrial forest had to some extent affected the economy and livelihoods of local community, particularly on community's interaction with mangrove forest for charcoal production.

Local Charcoal Production and Terrestrial Forest Concessions

In Batu Ampar sub-district and its neighboring Ketapang district, private logging company started to flourish to exploit the terrestrial forest in late 1960s until early 1990s. Batu Ampar village is strategically located as an exit access for logs from neighboring terrestrial forests and sawn timber to be exported. During this time, the port of Batu Ampar was busy with people from outside working in the concession companies. Until the beginning of 2000s, Batu Ampar was a strategic location for illegal timber industries where terrestrial woods were also taken illegally from neighboring forest.

Batu Ampar was not only busy with its port, but also with many concession companies built in the area, particularly when the government issued a policy to ban log forest in order to encourage the establishment of sawmills to convert log to sawn timber. Sawmills were employing workers from outside Batu Ampar as well as local people. In this period, Batu Ampar experienced prosperity; with many of the local livelihoods rely upon these companies.

Apart from working in the sawmills or logging companies, people in Batu Ampar village worked as fisher folks or mangrove charcoal production. Local people

produced charcoal from charcoal kiln for domestic use as well as marketed to Pontianak, the capital city of West Kalimantan.

In Batu Ampar, employment in charcoal production has been evolved alongside with the succession of terrestrial forest logging and timber industry. With the increase of sawmill production in Batu Ampar in 1970s-1980s, the charcoal producers switched their jobs to become terrestrial forest loggers or sawmill workers (IMReD 2007a). Similarly, some local capital owners were attracted to build sawmills. At the same time, the price of charcoal was dropped. However, starting from 1987 to 1995 many sawmills collapse and closed down due to difficulty to obtain terrestrial timber, high competition among sawmills, and strict government regulation. Apparently, many sawmills were not complied with the government regulation, thus regarded as illegal.

In 1987, local people started to return to the source of livelihoods in mangrove and charcoal production, due to the close down of sawmill industry. Former sawmill workers then changed their occupation as charcoal producers or worked in local market or port. New charcoal kilns were built. In 1970-1980 Batu Ampar village had around 30 charcoal kilns, and this number increased to 100 kilns in 1987. A local capital owner invested and built many new charcoal kilns during this time. The urge was due to the slow down of sawmills and saw the economic potency of charcoal. However, the increase production was lasted for two years only, because the market was not established, as the plan to export the charcoal was not succeeded. It is combined with low demand of charcoal in Pontianak. As a result, there was over supply of charcoal in Batu Ampar.

Mangrove Forest Concessions

Forest concession policy that issued since 1967 during the presidency of Soeharto was mainly on terrestrial forest, and only in 1978 a regulation on managing mangrove forest, which renown as 'seed tree method', was issued. Since then, three private companies that held mangrove forest concessions, namely Bumi Indonesia Jaya Ltd, Kalimantan Sari Ltd and Kayu Batang Arang Ltd., managed Batu Ampar mangrove area. These companies produced mangrove logs for export. However, in 1985, policy on prohibition of log export was passed, and mangrove exploitation by these companies was ceased.

In 1994-2002, a concession company, Inhutani II Ltd had an operational cooperation with BMPCI Ltd to exploit mangrove forest to produce mangrove chips in Riau, Sumatera. The company managed an area of 17,500 ha.

At present, there are two-mangrove forest concessions companies are operating in Batu Ampar. BIOS Ltd has been operated in Batu Ampar since 2003. The concession area is 9,950 ha for chips and charcoal production, where around 5,000 ha is production area for mangrove cutting. The market for chips is Taiwan and for charcoal is Japan. Another company is Kandelia Ltd that has not been operational

yet, but already awarded 16,000 ha mangrove concession from government. The company will also produce chips and charcoal.

The involvement of local people in these companies is limited. Only small part of local community is employed as workers. The companies tend to hire people from outside who have skills required by the company and not possessed by local people.

AFTER REFORM ERA

After the reform era in 1998, the authoritarian government has been lifted. Non-governmental organizations are flourishing and started to participate in various developmental activities including forestry and mangrove management. The private forest concession continues to become a government policy, both in terrestrial and mangrove forest. In addition, the central government started to acknowledge the importance of local stakeholders in resource management. With the same token, the Ministry of Forestry tried to include the local people in the management of mangrove production forest.

Mangrove Forest Concession by Community

In 1997, the Ministry of Forestry initiated a project to develop a production forest management plan by local people in Batu Ampar. The project commissioned by IMReD (Indonesian Institute for Mangrove Research and Development) and concluded that the mangrove forest is feasible for chips and charcoal production. Community facilitation on mangrove resource management was continued to be supported by central government and provincial government of West Kalimantan. In the process, an establishment of a local organization, '*Panter*' cooperative was encouraged and endorsed by the government (Santoso 2006a).

Panter cooperative is an organization for charcoal producers and fisher folks whose members are largely coming from Batu Ampar village and some are from two neighboring villages. It was established in 2000 with objectives to improve market channel and price for local charcoal producers and to provide legality on mangrove cutting area and charcoal production. The main aim of the cooperative is to improve the prosperity of the community without undermining the natural resources.

The government initiative on community facilitation in Batu Ampar was departed from a standpoint that community's charcoal production is illegal because local loggers do not have a legal forest to exploit and they even take woods from protected forest. In order to provide a legal basis for local charcoal production, in year 2001 the cooperative was awarded with a forest product harvest concessions permit (*Hak Pemungutan Hasil Hutan*) to utilize 300 ha mangrove forest for charcoal production. The local loggers could not achieve the quota for mangrove cutting, therefore the cooperative collaborated with the private mangrove logging, BMPCI Ltd to get part of the cutting quota and in return, the company paid to the cooperative. However, the

permit was valid for one year and the policy to issue such a permit was no longer endorsed by the government.

The payment received from BMPCI Ltd for the cutting quota and the membership dues paid by the cooperative members, was then utilized for a revolving fund for its members. It aimed at lessening the reliance of the charcoal producers to intermediaries for financial capital and market channel. The objective is to improve the bargaining position of the local charcoal producers with respect to charcoal price when negotiating with intermediaries.

Moreover, the cooperative tried to improve market access of charcoal to Pontianak and channeled the locally produced charcoal to a private charcoal company, BIOS Ltd. that exporting charcoal to Japan. However, the collaboration with BIOS Ltd was lasted for three months in year 2002. BIOS Ltd was no longer bought the community's charcoal because the quality of charcoal did not meet the standard for export and BIOS was insecure with the legality of mangrove wood that was taken from not a legal forest.

To provide the legality for local charcoal production, the cooperative has attempted to have a concession of 6,000 ha of mangrove forest. In 2001, the Pontianak District Government granted a management right for *Panter* cooperative to utilize 6,000 ha mangrove forest for production. However, to date this effort has not been fully achieved because the land status of the designated area is protected forest or 'for other use' and not production forest. The change of the land status must be endorsed by Ministry of Forestry. Moreover, the utilization of 6,000 ha production forest must be equipped with an environmental impact assessment, in which its development and endorsement would require financial resources.

The establishment of *Panter* cooperative had resulted in better charcoal price for the charcoal producers. In turn, charcoal production became more attractive as a source of income for Batu Ampar villagers. Due to this reason and other conditions – which will be explained below – the number of charcoal kilns in Batu Ampar village in 2007 has increased significantly.

However, after 3 years running, *Panter* cooperative ceased work in 2004. Some factors contributed to this situation, but it was mainly because the internal institution of the organization was not well established. The revolving fund that lent to some members was not returned to the cooperative. The debtors preferred to sell their charcoal to intermediaries to receive a full amount of price or revenue. If they sold their charcoal to cooperative, the revenue that they received must be deducted. The cooperative was too tolerant and no sanctions were imposed to the non-conforming members.

Leadership in the cooperative was lacking. In 2004, the chief of the cooperative moved out and active in the political party and activity. This has further exacerbated the intra-community interest conflicts. Community members having different political support would likely to confront the initiative initiated by the others. Similarly, intermediaries and some community members oppose the presence of Panter. The cooperative might endanger the interests of the middle-men as it tries to replace its role as the buyer and capital support for the charcoal producers. Some middle-men and their supporters often discredited *Panter* cooperative proponents. These intra-community complexities were difficult to be addressed by the external assistance. In summary, local collective action through cooperative is failed, and the community mangrove forest concession is not yet established.

Latest Situation of Local Charcoal Production

The consumer of charcoal is restaurant or bakery shop in the cities, and village household. Based on their quality, charcoal is distinguished into three classes. Class A is charcoal having a complete cylinder with diameter 6-20 cm and length 30 cm, which is usually marketed to Korea. Class B is charcoal with incomplete cylinder, length more than 10 cm, which is sold for Pontianak market. Class C is broken charcoal of palm size, which is used for producing briquette in Pontianak and then marketed to Pontianak and Jakarta which then exported. Its class determines charcoal price, where class A is the most expensive (IMReD 2007a). Charcoal that produced in Batu Ampar village is normally Class B and C.

In early 2000s, the demand of Batu Ampar charcoal from Pontianak increased from 20-30 tons per month in 1990 to 100 tons in 2000. This happens because the price of kerosene that is used for household use was increased. Charcoal is then used as an alternative energy, particularly for people living in the villages. On the other hand, the production of charcoal in Batu Ampar became more attractive. *Panter* cooperative had contributed to the increase of charcoal price. Moreover, with the decreasing terrestrial forest in West Kalimantan in 1990s and the collapse of sawmill industry in Batu Ampar, village of Batu Ampar relies on mangrove forest as a livelihood option, apart from fishery.

This high reliance of Batu Ampar village on mangrove ecosystem is different from neighboring villages such as Nipah Panjang, Teluk Nibung, or Kubu, whose livelihoods are relying upon agriculture (i.e. paddy field, vegetables, and brown sugar), coconut plantation and coastal fishery. On the other hand, Batu Ampar village is surrounded by mangrove forest and endowed with red soil. Red soil is an important material for building and charcoal kiln and its maintenance, which is rare or non-existent in the neighboring villages.

A charcoal kiln is made of red soil and built like an igloo. Red soil has a good endurance for heat, and the more heat it receives, the stronger the kiln will become. Red soil is available in the mountainous area of Batu Ampar village. To protect the

kiln from rain, a roof made of nypa leaves is built. With the increased price and demand of charcoal, it is inescapable that the number of charcoal kilns is increasing (Santoso 2006b). During the field study in December 2007, there are 230 kilns in Batu Ampar village, which was increased from 90 kilns in 2000 (figure 2). In year 2007 itself, a number of 119 charcoal kilns were built. The production capacity of individual kilns ranges from 0.5 tons to 6 tons of mangrove woods and the process takes 30-40 days.

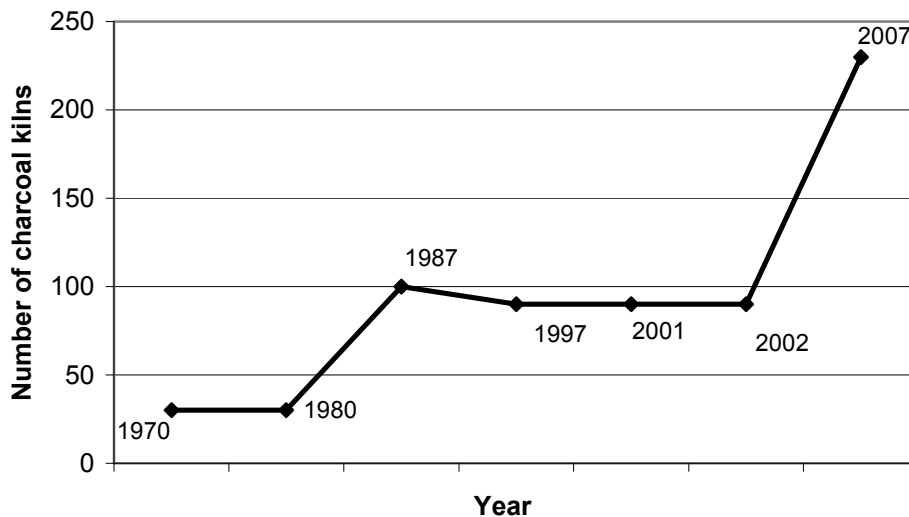


Figure 2. Trend of charcoal kilns in Batu Ampar village

To explore the issue regarding to what extent the current charcoal production gives impact to mangrove forest, the carrying capacity of mangrove forest is calculated based on the following estimate. Total number of charcoal kiln is 230 and each produces 5 times annually with output 2.13 tons charcoal per production. With current production capacity, the annual production of charcoal is almost 2,500 tons. Using the local kiln, the ratio between charcoal (output) and mangrove wood (input) is 0.2. Therefore, in a year Batu Ampar village will need 12,500 tons or 10,375 m³ of mangrove woods of *Rhizophora apiculata*, *Rhizophora mucronata*, *Bruguiera gymnorrhiza*, or *Bruguiera parviflora*. Annually this amount of woods can be taken from 68 ha of mangrove forest. The regeneration of mangrove tree is 30 years per cycle. This means that the current capacity of charcoal kiln needs around 2,050 ha of mangrove forest to make charcoal production and mangrove forest sustainable.

On the other hand, the area of Batu Ampar mangrove forest is 65,585 ha consists of 33,401 ha protected forest and 32,183 ha production forest (IMReD 2007a). It can be concluded that the current charcoal production can still be sustained by the existing mangrove forest. However, a careful attention must be given to specific forest areas where local loggers continue to cut mangrove trees.

Local charcoal production in Batu Ampar village is carried out in a traditional manner. In cutting mangrove tree, local loggers use small boat that can carry 1.5 m³ of woods and cut using an axe and not chainsaw (Santoso 1998). Loggers take woods in mangrove forest that can be reached for one to three hours by motorized boats. In rainy season, they usually take woods not far from the charcoal kilns. A specific location for woods take off are regularly taken by logger for months, even for some years.

Location of mangrove cutting by community is distributed in some sites, i.e. Padang Tikar, Panjang Island, and Padu Empat Island. During rainy or West season, community loggers cut mangrove tree in locations easily accessed, nearby their home such as Kemuning River, Pagar River, Kadir River, and Teluk Nibung River. Community has limited capacity for logging due to the use of traditional tool, which is axe and small boat. With this condition, the impact of community logging is not apparent and the ex-logged area can be easily covered (IMReD 2007a).

Mangrove condition in Batu Ampar can be indicated from the tree potential of mangrove forest. In 2007 IMReD took samples of 22 transects all over Batu Ampar. The result shows that the average tree potential is 181 m³/ha (IMReD 2007b). These transects covered mangrove forest with status of protected forest, production forest, and for other uses. The average tree potential for protected forest is 196 m³/ha, production forest 172 m³/ha, and other uses 150 m³/ha.

Furthermore, mangrove forest where local community often take mangrove woods has the average tree potential 169 m³/ha. The bad condition of tree potential exists in Radak area that has the tree potential in this area is 95 m³/ha. This area is where mangrove loggers from Kubu village often take woods and categorized as ecotone area, a transition area between mangrove and terrestrial forest. Mangrove loggers in Kubu village take woods in more limited number of sites compared with the mangrove loggers in Batu Ampar village. Thus, the sites where Batu Ampar villagers take mangrove woods show better condition, with an average of tree potential 192 m³/ha. On the other hand, the sites where Kubu villagers take mangrove has an average of 113 m³/ha. This shows that specific forest areas where local loggers continue to cut mangrove trees might be degraded, which drive them to move to other locations. Trees in one location are regularly taken by logger for months, even for some years.

Role of Internal Institution

The impact of the shifting logging that practiced by local community is not apparent and the ex-logged area can be easily covered (IMReD 2007a). Local loggers maintain operational rules, which Ostrom et al (1994) defines as rules that directly affect day-to-day decisions made by the resource users. They experience appropriation problems on how to appropriate or cut the mangrove trees.

Local rule on mangrove cutting is maintained, which is locally called as '*sistem retas*' or ripping open the mangrove forest to enter the forest with their small boats. This rule was evolved due to their interaction with crab and shrimp fishermen. Local loggers must go into the forest for 50-200 meters to cut mangrove trees. Only inside the forest that they can obtain straight and tall trees that are needed for the charcoal production. In addition, this rule prevents loggers to cut tree on the forest margin, where shrimp fishermen usually fish and put their shrimp nets. Crab fishermen put their nets in 200-500 meters inside the forest. With this rule, each tries to respect other's source of livelihoods in utilizing mangrove ecosystem. Furthermore, some work as seasonal loggers and fishermen. Thus, they try to maintain a sustainable condition of the mangrove forest because they understand that when mangrove ecosystem destroyed it will harm their livelihoods as loggers and shrimp or crab fishermen.

This coordinated strategy among different type of resource users was also encouraged by forest rangers and external facilitators. In the hype of terrestrial forest logging in Batu Ampar, forest rangers were assigned and lived in the area. At that time, mangrove forest logging was not given much attention and their main function was to control terrestrial forest logging (MoF and IMReD 1997). Even so, they raise the community's awareness to maintain 50-meter green belt of mangrove or terrestrial forest along the river banks and to cut mangrove tree with axe and not chainsaw (MoF and IMReD 1997).

For charcoal production, loggers only cut mangrove trees of *Rhizophora* spp. and *Bruguiera* spp. They cut specific trees with diameter above 15 cm and below 30 cm. Tree with diameter above 15 cm is selected because during the incineration it produces less ashes. On the other hand, tree with diameter more than 30 cm is too heavy, thus difficult to cut using axe and to transport using small boats. The specific prerequisite for mangrove charcoal, along with the traditional and manual tools that the loggers use has prevented them to take the seed trees, which are trees that have a lot of fruits and can bring new trees (Santoso 2006b). This traditional practice conforms the ecological point of view that promotes a seed tree method for mangrove forest logging. When external facilitators encouraged local loggers not cutting the mangrove seed trees, loggers had need only to reinforce their existing practice.

In Batu Ampar village that relies on mangrove for charcoal production, not all sub-villages or communities have parallel operational rules on mangrove cutting. It depends on the time horizon of mangrove utilization and the community access to external facilitators. Charcoal production in Sungai Limau community have evolved for some decades, and therefore has better internal rules on mangrove cutting. On the other hand, Teluk Air community, which only built charcoal kilns in 2005 and thus introduced charcoal production more recently, seems have no internal rules.

External facilitation through government or non-government projects normally arrived in the hub of Batu Ampar village, which is Sungai Limau sub-village. In contrast, Teluk Air sub-village had only been visited regularly, and in some cases there were intra-community interest conflicts that prevented external facilitation to run in Teluk Air sub-village. Charcoal producers in Sungai Limau maintain that loggers must take mangrove woods using axe and not chainsaw. This is to ensure fairness yield for all loggers and charcoal producers, and at the same time to sustain the forest. However, this rules was not found in Teluk Air sub-village and loggers also used chainsaw to cut mangrove tree.

Local operational rules on mangrove cutting, *sistem retas*, provide regulatory framework for local loggers. This rules offer some advantages, but still possess some drawbacks. The rule defines the forest area where loggers can cut mangrove trees and leaves behind mangrove trees that are important for natural regeneration. Loggers use traditional tools which impact slightly to mangrove forest. However, some drawbacks of current practice are identified. There is no logging plan and coordinated action among local loggers to determine logging area. Thus, specific forest areas might be highly degraded. Tree replanting is not implemented and loggers rely on natural regeneration of mangrove tree. Finally, internal monitoring on the implementation of local rules does not exist (Santoso 2006b).

Batu Ampar villagers' reliance on mangrove ecosystem has been able to prevent the mangrove forest conversion to other uses. For instance, in the neighboring of Dabung village (Kubu sub-district), shrimp ponds were established in year 1998, which were converted from the protected mangrove forest. The fishpond establishment was introduced by people from outside, the Buginese ethnic. The conversion has been endorsed by Governor and the Marine Affairs and Fisheries Office, even though it was not in line with the policy from Forestry Office that promotes conservation of mangrove forest. In 2007 total shrimp ponds in Batu Ampar mangrove biosphere is 1,009.84 ha, that located 350 ha in Dabung village, Kubu sub-district, and the rest is in Seruat village, Teluk Pakedai sub-district. These shrimp ponds were located in protected mangrove forest (IMReD 2007a). In Kubu village charcoal production is limited, while it does not exists in Seruat village.

Role of External Institutions

Actions taken by charcoal producers and local loggers are not only influenced by operational rules, but also by collective-choice rules and constitutional-choice of rules (Ostrom et al 1994). These rules are devised and determined by government, both before and after reform era. Batu Ampar mangrove biosphere is defined by the government in two land use, protected and production forest. Ministry of Forestry produced a forest land use planning, which was then incorporated into the Spatial Plan of West Kalimantan Province. Based on existing policy, mangrove protected area is 33,635 ha and the mangrove production area is 31,950 ha (IMReD 2003).

Based on this policy, mangrove logging by local loggers is illegal because they often take woods from protected forest. However, local loggers do not acknowledge this policy, because they did not participate in the decision making process that largely done by central government and they have carried out the practice in the area for decades. Moreover, the previous land use forest policy that implemented before 1982 was designated the locations of local mangrove logging as production forest. However, the new land use policies enacted in 1982 and later renewed in 1992 was designated the area as protected forest.

Local community is confused with the land use policy and it does not reflect the real situation of community's utilization. The area designated as protected forest has long been used for mangrove cutting by local people because it can be conveniently reached by loggers. On the other hand, the area designated as production forest was situated next to villagers resident, where mangrove cutting is not allowed by villagers in order to prevent flooding. This local situation is not reflected to the policy that designated by the government. As a result community continue to cut mangrove woods in their regular area regardless what stated by the government policy.

With regard to local charcoal production, a number of government regulations was once implemented. During Dutch and Japanese occupation before 1945, local charcoal producers were given the rights to utilize mangrove forest by way of developing mangrove parcels to be extracted. In addition, there was specific areas designated for extract fish, crab and shrimp. In 1945-1958, the mangrove utilization permit for charcoal production was continued by the Kubu sultanate.⁷ At that time, mangrove charcoal was utilized for household use. In 1971-1985 mangrove utilization permit was issued mainly for mangrove log export. Charcoal production was not attractive, because the introduction of kerosene for household use. In year 1992, the Forestry Office of West Kalimantan Province issued a list of woods that could be utilized for small-scale Industry. The mechanism to obtain the permit for mangrove wood was combined with forest concession rights. However, due to low attraction of charcoal production, because of its low market price, local charcoal production gave little attention to the policy (MoF and IMReD 1997). In brief, apart from the Panter cooperative and community mangrove concession area that were introduced by government and IMReD, there is no existing formal regulation that regulates the mangrove forest utilization for charcoal production.

Monitoring and surveillance by government institution on mangrove protected forest and mangrove woods extraction was limited. During the glorious period of terrestrial forest logging in 1970s-1980s in Batu Ampar, forest rangers were assigned in the area, even though not much attention and surveillance were given to mangrove forest. With diminishing terrestrial logging activities in Batu Ampar, currently there is only one forest ranger assigned.

⁷ Kubu Sultanate was dismantled by the government in 1958.

Since 1990s, government promoted sustainable mangrove forest management to local community in Batu Ampar through a number of activities and facilitation. Government institution involved were from central and provincial level, such as Ministry of Forestry, Ministry of Marine Affairs and Fishery, Environmental Office, Cooperative Office, and Industrial Office. Some of the facilitation activities were among others promotion of alternative economic livelihoods for the community, through such as mangrove crab aquaculture; improvement charcoal's quality and market channel; introduction coconut-shell charcoal; establishment cooperative; and establishment mangrove management plan. Some of the facilitation projects had been contracted out and undertaken by the Institute of Mangrove Research and Development (IMReD) since 1997.

Since 2006, a three-year project financed by the UNEP GEF and government of Indonesia is being undertaken in Batu Ampar mangrove demonstration site. The long-term goals of the Batu Ampar demonstration site are to sustain the functions and benefits of the mangrove ecosystem as the life support system for the local community and to sustain the globally and regionally significant biodiversity of the area. Over the three years, the project aims to establish a participatory management system involving all stakeholders in agreed actions to reduce the rate of mangrove degradation and improve the benefits to the local community derived from the mangrove ecosystem. To this end, Batu Ampar mangrove management committee was established. The committee consists of government agencies, universities and non-governmental universities, aims at having a coordinated policy towards mangrove management. The policy tool is the district land use plan. Any development request that situated or may influence Batu Ampar mangrove is assessed for endorsement by the Committee.

CONCLUSIONS

The research seeks to examine the underlying factors explaining the relatively good condition of mangrove in Batu Ampar. The human-nature interactions to mangrove ecosystem in Batu Ampar are examined based on political situation before and after the reform era.

Charcoal production in Batu Ampar village can help to prevent the conversion of mangroves into alternative uses. After the glory days of terrestrial timber industry was ceased in end of 1990s, charcoal production and coastal fishery become main sources of livelihoods for community in Batu Ampar village. Other villages within the Batu Ampar mangrove biosphere, such as Kubu and Seruat villages, experienced conversion of mangrove protected forest into shrimp ponds. Community's reliance on mangrove forest for charcoal production in these villages is limited or does not exist.

Since 2000s, charcoal production in Batu Ampar village has been increasing, due to diminishing terrestrial timber industry, high demand of alternative energy and

increase of charcoal price. In 2007, total number of charcoal kiln is 230, with annual charcoal production almost 2,500 tons. Based on calculation of carrying capacity, the current charcoal production can still be sustained by the existing mangrove forest. However, a careful attention must be given to specific forest areas where local loggers continue to cut mangrove trees.

Operational rules on mangrove cutting for local charcoal production are maintained. Some communities in Batu Ampar village follow specific rules on where and how to cut mangrove trees and what trees that can be cut. However, internal monitoring on the implementation of these rules does not exist. Coordinated actions among loggers on the planning areas for cutting are not established. Nevertheless, Batu Ampar villagers' high reliance on mangrove ecosystem for charcoal production and coastal fishery has contributed to the relatively good condition of mangrove forest.

The evolution of local rules on mangrove cutting is also encouraged by the monitoring of forest rangers and external facilitation. However, the monitoring of protected mangrove forest is largely limited. Local loggers are not fully acknowledged the presence of protected forest and continue to cut mangrove for charcoal production. Low local recognition of forest land use that consist of protected and production forest is because the delination does not reflect local condition and the decision making was done by government alone.

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