

An Initial Assessment of the Potential Contribution of ‘Community Empowerment’ to Mitigating the Drivers of Deforestation and Forest Degradation, in Giam Siak Kecil-Bukit Batu Biosphere Reserve

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Abstract—Indonesia has experienced annual forest fires that have rapidly destroyed and degraded its forests. Fires in the peat swamp forests of Riau Province, have set the stage for problems to worsen, this being the ecosystem most prone to fires (which are also the most difficult, to extinguish). Despite various efforts to curb deforestation, and forest degradation processes, severe forest fires are still occurring. To find an effective solution, the basic causes of the problems must be identified. It is therefore critical to have an in-depth understanding of the underlying causal factors that have contributed to deforestation and forest degradation as a whole, in order to attain reductions in their rates.

An assessment of the drivers of deforestation and forest degradation was carried out, in order to design and implement measures that could slow these destructive processes. Research was conducted in Giam Siak Kecil–Bukit Batu Biosphere Reserve (GSKBB BR), in the Riau Province of Sumatera, Indonesia. A biosphere reserve was selected as the study site because such reserves aim to reconcile conservation with sustainable development. A biosphere reserve should promote a range of local human activities, together with development values that are in line spatially and economically with the area conservation values, through use of a zoning system. Moreover, GSKBB BR is an area with vast peatlands, and is experiencing forest fires annually. Various factors were analysed to assess the drivers of deforestation and forest degradation in GSKBB BR; data were collected from focus group discussions with stakeholders, key informant interviews with key stakeholders, field observation and a literature review.

Landsat satellite imagery was used to map forest-cover changes for various periods. Analysis of landsat images, taken during the period 2010–2014, revealed that within the non-protected area of core zone, there was a trend towards decreasing peat swamp forest areas, increasing land clearance, and increasing areas of community oil-palm and rubber plantations. Fire was used for land clearing and most of the forest fires occurred in the most populous area (the transition area). The study found a relationship between the deforested/degraded areas, and certain distance variables, i.e. distance from roads, villages and the borders between the core area and the buffer zone. The further the distance from the core area of the reserve, the higher was the degree of deforestation and forest degradation.

Research findings suggested that agricultural expansion may be the direct cause of deforestation and forest degradation in the reserve, whereas socio-economic factors were the underlying driver of forest cover changes; such factors consisting of a combination of socio-cultural, infrastructural, technological, institutional (policy and

governance), demographic (population pressure) and economic (market demand) considerations. These findings indicated that local factors/problems were the critical causes of deforestation and degradation in GSKBB BR. This research therefore concluded that reductions in deforestation and forest degradation in GSKBB BR could be achieved through ‘local actor’-tailored approaches such as community empowerment.

Keywords—Actor-led solution, community empowerment, drivers of deforestation and forest degradation, Giam Siak Kecil–Bukit Batu Biosphere Reserve.

I. INTRODUCTION

DEFORESTATION and forest degradation are terrifying prospects, especially for tropical countries. A plethora of studies on these environmental problems indicates that the latter occur under various circumstances, and thus cannot be attributed to a single or limited number of trigger/s. The reports cited in [1], [2], involved in-depth case studies of the causes of tropical forest decline around the world, and categorised the causes as either *proximate causes* such as land clearing for agriculture (direct drivers), or *underlying driving forces* (indirect drivers), such as global market demands, national policies [3], [4], population pressure [5], absence of alternative incomes, and use of easy, cheap and fast methods for land clearing. Their findings suggest that rates of tropical forest decline vary greatly, according to the particular mix of various proximate and underlying causes, under various geographical and historical conditions. The historical contexts of deforestation and forest degradation causes are highlighted in the studies cited in [6]–[8].

The most prevalent proximate causes for tropical forest declines were found to be the expansion of agriculture [2], [9]–[13], and illegal logging [14]; whereas the primary underlying causes were often associated with social factors, [1], [2], [13], [14]. Although these direct and indirect causes of deforestation and forest degradation have been identified, there is still the question as to why efforts to mitigate these environmental problems have very often been ineffective. What factors impede the success of these efforts?

One study [15] concludes that sustainable use of natural resources is really about managing human relationships, rather than technical interventions. Unfortunately, in many tropical forest areas, local people have not been empowered to manage

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their own resources without any external interventions. Local people are often seen as a threat, rather than part of the management solution [16]. Communities and their environment form a socio-ecological system, and efforts towards halting deforestation and forest degradation must consider systemic principles. One of the main principles of a system approach ('systems thinking') is that the solution to the problem exists within the system itself [17]. This principle would suggest that successfully halting and reversing deforestation and forest degradation requires that various ecological, socio-economic, cultural, and institutional factors be addressed in a locally specific manner.

II. THEORETICAL BACKGROUND

Natural resource conservation initiatives often reflect national and even global interests, but conservation may be perceived as having reduced access to resources and welfare. As a result, conservation is often regarded as unfair, inefficient and unsustainable, as it limits the potential to exploit certain natural resources important for human survival, in the context of local communities, and their access to arable lands.

Various studies [18]-[21], have concluded that such conditions are caused by the lack of apart being played by the public (both individual and institutional) in decision making related to the management of protected areas; especially the absence of participation [22] and/or self-mobilization [23], both of which terms relate to the highest level of community involvement. Community participation can help in the identification and understanding of that community's interests, and provide a way to integrate social and environmental concern into the decision-making process.

Community empowerment emphasises the importance of involving the community early on, to ensure the sustainability of the programme itself. The use of local resources has often been shown to foster a sense of belonging among the people, to change the mind-set and behaviour, and even create a sense of shared responsibility. Motivation was derived from a sense of attachment to place (place attachment). Many researchers, [24]-[28] demonstrated that people who have an attachment to a place will exhibit environmentally responsible behaviour (ERB) and how an attachment to local resources can influence ERB [29]. Attachment to resources owned by the public will increase that public's concern to protect and preserve, as well as helping to reduce expenditure on government programmes, because the resources already exist in the community.

Participatory management involves public participation in both planning and implementation activities. Through participation, the public should understand the major issues and be given a chance to find a way to solve any problems. Thus, it is expected that local communities would have a deeper understanding of the areas in the vicinity, improving communication, and creating strong cohesion and consensus among them.

The local community is a vital major stakeholder and it should participate in the management of its locality, to ensure sustainable use of resources. Environmental problems must be understood as being part of the larger social framework, as a

part of social integration, and must be addressed from this perspective. People must be able to express their views and opinions, in order to ensure their full participation; or in other words, self-mobilization. Thus, the empowerment of that local community is essential, ensuring that they have a role in the decision-making process.

The dynamic behaviour of social systems is not well understood, and as a result, very often, government programs have failed to find a solution. A system approach assumes that any system is a closed system, meaning that the solution to that system's problem should be found within the system itself. Logically, one should first identify the underlying factors that are causing the problems. Therefore, it is important to identify the drivers and underlying causes of deforestation and forest degradation

As mentioned earlier, socio-economic factors were identified as the underlying causes that drive deforestation and forest degradation. From a systems approach, this suggests that an actor-led initiative/approach could well offer solutions for the reduction of environmental problems.

III. STUDY SITE AND METHODS

A. Study Site

Giam Siak Kecil-Bukit Batu Biosphere Reserve (GSKBB BR) is the first biosphere reserve in the world to be nominated and co-managed by the private sector; in this case, Sinar Mas Forestry. In 2006, Sinar Mas Forestry and its partners formally proposed that the Giam Siak Kecil and Bukit Batu landscapes be a biosphere reserve. In 2009, the area was declared by the Man and Biosphere Programme (MAB) of UNESCO, to be a biosphere reserve with three main functions: (1) biodiversity conservation; (2) sustainable economic development; and (3) research and development facilitation.

To implement these three functions, a zoning system, made up of core areas, buffer zones and transition areas, was applied. The core area of GSKBB BR consists of peat swamp forest ecosystems, and is a combination of the Giam Siak Kecil Wildlife Sanctuary, Bukit Batu Wildlife Sanctuary, and plantation forests. The plantation is managed by Sinar Mas Forestry and its partners, plays a role as a wildlife corridor, linking both wildlife sanctuaries. Similarly, the buffer zone of GSKBB BR mostly consists of plantations managed by Sinar Mas Forestry and its partners. It functions as a protective insulator for the core area. Most of the transition area of GSKBB BR consists of palm oil and rubber plantations, and areas in use for agriculture, food production, fisheries, and rearing livestock, as well as housing and infrastructure.

GSKBB BR was selected as the study site for various reasons: (1) It is the first conservation area that was proposed by the private sector, (2) Most of its area is peat swamp forest; (3) The surrounding human settlements, in combination with its function as a biosphere reserve, should offer a good opportunity to observe the dynamic of the people-nature relationship.

B. Methods

Field observations were carried out in two districts within the administrative region of GSKBB BR. Selection of the sample villages was based on their proximity to the core area of GSKBBR. Five villages adjacent to the core area were

selected as the study sites (Fig. 1): Temiang, Tanjung Leban (buffer area), Tasik Serai Barat (buffer area) and Tasik Serai Timur (buffer area) Villages, within the District of Bengkalis, and Tasik Betung Village (core area, enclave) within the District of Siak.

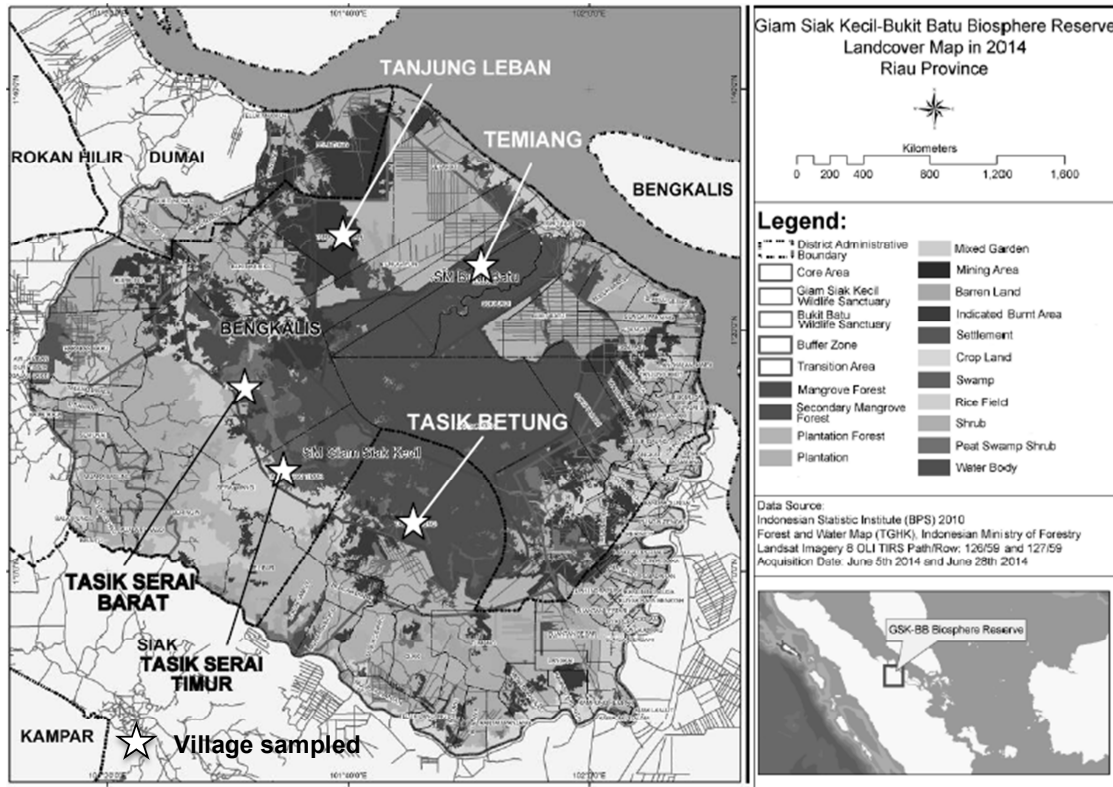


Fig. 1 Location of village samples as study sites in GSKBB BR

In addition to field observation, data were collected through direct observation, interviews, focus group discussion (FGD) and a literature review. Direct observation involved direct and immediate observation of the physical environment of the area, including the socio-economic situation. This was combined with interviews, which were conducted with people who had good knowledge and awareness of the state of affairs of the locality, and who were considered 'key informants'. Such individuals included the Chief of the Village or their representative, local government officials, the Head of the MAB programme within The Indonesian Science Institute (LIPI), Sinar Mas Forestry, and the management of the Natural Resource Conservation Agency of Riau Province. Information was gathered from these key informants using structured interviews, to fill information gaps, as well as from secondary data, document screening and other supplementary sources.

FGDs were conducted twice, and involved all identified stakeholders, including all key informants, NGOs and academic professionals in the fields of forestry, socio-economy, agriculture, and protected areas. An effort was made to obtain combined, balanced information from all potential

sources, on any given issue. Respondents offered their views, based on their own perceptions, influenced by their value judgment of the losses and benefits they might experience.

Since the biosphere reserve has been established in 2009, analysis of land use changes from 2010-2014 was done by overlaying forest cover and land use maps for the year 2010, 2012 and 2014 and calculating the changes in the total area.

IV. RESULTS AND DISCUSSION

A. Drivers of Deforestation and Forest Degradation

Riau is a province of Indonesia with a total of 45% peat lands, and it comprises the largest peat area in Indonesia (and 56% of the total area of peatlands in Sumatra). It is among the provinces that suffer the most from frequent forest and land fires. Since 1997, no single year has passed without widespread forest fires. Reference [30] shows that between the years 1990-2007, the total CO₂ emissions resulting from forest degradation, peat decomposition and fires in Riau reached 3.66 G tonnes, whereas in 2012 alone, such emissions were estimated to be 1.91 million tonnes [31]. This figure comprised of more than 50% of the total for the 18-year period

to 2007. In 2013, around 95% of the 'hotspots' (a particularly active part of a fire) in Sumatra occurred in Riau Province, and 78% of them were located within peatland [32]. Conflicting opinions arose as to who caused the fires, as blame was often placed on either the big private oil palm plantations or smallholder farmers [32], [33]. However, some observation and analyses [32] led to a preliminary conclusion that it was actually the fault of local investors, who were often migrants (mostly from Northern Sumatra), and who took the advantage of local rules to acquire land and bring in their own labour to clear it for oil-palm expansion; a similar pattern was seen to exist elsewhere in Riau.

Representing about 10% of Riau's peatland, GSKBB BR is experiencing significant forest loss annually, and suffered much of this loss through forest fires, including the 2014 forest fire (Table I). One study [34], set in the biosphere reserve, arrived at similar preliminary conclusion to that in [32], and was based on the spatial distribution of the fires, which occurred mainly in plantation areas but outside the big-plantation concessions. Considering the importance of GSKBB BR in terms of peat swamp forest and biodiversity conservation as well as local community welfare, various factors were analysed in this research, to assess the causes of deforestation and forest degradation in the biosphere reserve. Based on Presidential Decree No.62/2013, deforestation in an Indonesian context is defined as "the permanent change of forested areas into non-forested areas", whereas forest degradation is defined as "a decrease in the quantity of forest cover and carbon stocks for an indefinite period".

TABLE I
LAND COVER AND LAND USE CHANGES (2010-2014)

No.	Land Cover & Land Use	Total Land Cover Changes(ha)		
		2010	2012	2014
1.	Mangrove forest	1548	1401	1182
2.	Secondary mangrove forest	220227	193868	170994
3.	Plantation forest	12651	155990	125439
4.	Plantation	89789	108720	137 805
5.	Mixed garden	75748	110743	65273
6.	Barren land	85718	58 088	129 190
7.	Settlement	8895	9383	9669
8.	Dryland agriculture	12559	7020	13322
9.	Swamp	17046	17506	10870
10.	Rice field	4962	5990	4954
11.	Shrubs	34095	17305	17926
12.	Peat swamp shrub	26936	17722	17124

Table I indicated that expansion of agricultural land is responsible for deforestation and forest degradation in GSKBB BR. This was evidenced by the highland cover and land use changes from forest to barren lands and to mixed gardens (rubber and oil-palm plantations), suggesting land clearing activities took place. These data were supplemented by the results of interviews and FGDs that identified agricultural land expansion as the direct cause of deforestation and forest degradation. This conclusion supported previous conclusions, [32], [34] that land clearing for agriculture was the primary reason for forest fires in GSKBB BR. Similarly,

research [10] in 46 tropical and sub-tropical countries, also concluded that agriculture is a major driver of deforestation in developing countries.

Expansion of agricultural land (via land clearing activities) occurred for many underlying reasons. Through a comprehensive analysis involving the local stakeholders, government officials, private sectors, NGOs and scientists/academics working in GSKBB BR, the following categories were identified as providing an appropriate framework for analysis of the predominant drivers of deforestation and forest degradation (see Fig. 2) were identified as being the predominant drivers of deforestation and forest degradation, arising from agricultural land expansion: socio-cultural, infrastructure, biophysics and technology, institutional (policy and governance), demography (population pressure) and economy (market demands).

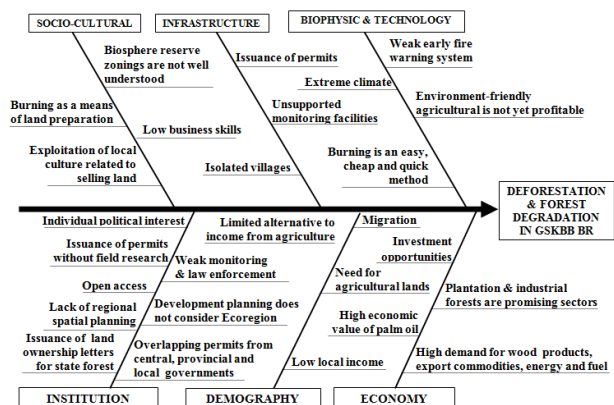


Fig. 2 Drivers of deforestation and forest degradation in GSKBB BR

Fig. 2 clearly indicates that drivers of deforestation and forest degradation in GSKBB BR were actually local in origin. The institutional aspect comprised the most variables, suggesting weak policy and governance, which provided the enabling conditions for land clearing to occur; involved parties taking advantage of the local culture, and local social and economic conditions. Reference [35] identifies policy and governance as important factors affecting the condition of forest cover in a particular area. The existence of a local government policy that granted permits to traditional communities to clear land under two hectares by burning has prompted migrants to take advantage of these opportunities to acquire lands from the community and then open the land up by burning. This is supported by evidence that sporadic fires were found in areas close to settlements, and in areas with high numbers of migrants (see Fig. 3). Based on interviews with the local people, and FGDs, it was found that local people can easily sell their lands to migrants. The indigenous local people wanted to sell their land to migrants from Northern Sumatra for economic reasons; they felt that they owned the land, but did not have the money and resources to maintain it. Reference [32] found the exact same practice by migrants from Northern Sumatra in Tesso Nilo National Park, which is also located in Riau Province. Results from this

research have added to the growing empirical evidence has identified the causes of deforestation in tropical forests, either directly or indirectly [12], [36].

B. Underlying Causes of Forest Cover Change

As discussed previously, deforestation is a complex of web of factors that vary temporally and spatially, hence require the understanding of which factors related to time and space that

were at work for a given situation. Therefore, understanding the underlying causes of forest-cover change that drive deforestation and forest degradation in GSKBB BR is very crucial. Such factors were analysed based on map overlay of burnt areas and roads occurring in GSKBB BR (Fig. 3). As justified by [37], roads are key factors for integration and market expansion, making forest conversion more profitable.

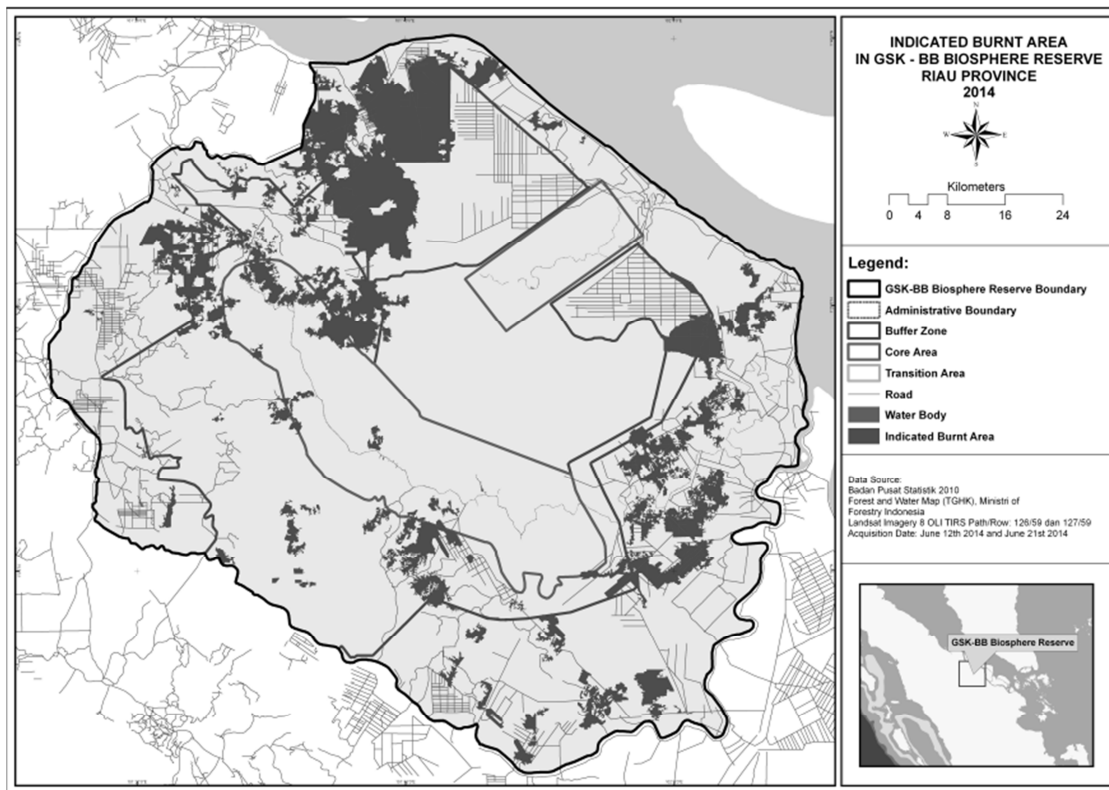


Fig. 3 Indicated burnt areas in 2014 in GSKBB BR

Location- Fig. 3 summarised the previous discussion of the results that there is a relationship between forests fires with space variables (roads, villages and core area). The shorter the distance to the core area, the lower the occurrence of fires as Landsat image analysis showed an increase in forest clearance moving away from the core area. In general, deforestation and forest degradation occurred in places adjacent or close to roads and villages even at the edge of the forest which is the border between the buffer and the core, that were dominated by oil palm and rubber(mixed gardens). This result was supported by a research by [36] whom found that farmers along the border of the forest were the direct cause of forest clearing.

Results of aerial observation, confirmed the occurrence of intact forest near the road, except in areas where road are being established and widened. Fig. 3 also showed that there were more deforestation occurred at the edge of buffer zone and the transition area. These results also proved that transition area experienced the largest area of degraded forests. Based on interviews and FGD conducted, bigger and

wider forest fires occurred close to migrants-centred area. This result supports the previous findings by [34] in 2013.

Accessibility- Accessibility is a significant parameter to explain the observed patterns of deforestation and forest degradation in GSKBB BR. The correlation with space variables as discussed earlier, showed that access to roads and forest could affect the rate of deforestation. Correlation of variable distance with other parameters such as accessibility of local farmers to the forest and their attitudes towards the biosphere reserve, were important to be analysed. People in the studied villages in the core and buffer areas stated their lack of understanding of the 'Biosphere Reserve' concept. During the interview, all respondents said that their accesses to the forest were restricted since the establishment of the reserve, but on the other hand, they supported the existence of the Biosphere Reserve. In addition, data analysis indicated that the expanses of barren land area were caused by increased conversion of forests into agricultural land, and the selective cutting for firewood and construction of houses.

Social, Economic, Politic and Cultural Factors- Results of aerial observation and interviews revealed that local communities are still in need of livelihood. The permanent conversion of forest into agricultural land for mixed garden and oil palm plantations showed that deforestation has taking place in GSKBB BR. The analysis indicated that the patches of forests in the transition area and the buffer area were more vulnerable to human impacts/anthropogenic activities that caused forest fires. In core area that was not part of protected area, the trend since 2010, was a decrease in the secondary swamp forest and increases in mix gardens (owned by the community) and barren land. Land cleared outside plantation forest was allegedly burned to clear the land to be planted with oil palm/rubber. The expansion of agricultural land occurs triggered by socio-economic factors, especially population pressure, weak enforcement of laws and regulations in the field as well as the utilization of indigenous culture that is easy to sell the land. Interviews with the local traditional farmers and data from [37] confirmed the increase in the number of migrants, whom eventually required land, hence forcing the local and traditional farmers into marginal areas and sell their land. In fact, Fig. 3 showed that the largest burned area occurred in the transition zone, which has the functions as settlement and cultivation areas, and also occurred in areas with the highest migrants' population. These facts suggested that deforestation and forest degradation in GSKBB BR were triggered by the interlinks of underlying local factors

C. Community Empowerment

Reducing deforestation and forest degradation would require that ongoing conservation activities and development, in the zoning parts of the biosphere reserve, be actor-led. Reference [38] suggests that in order to reduce deforestation, more attention should be paid to consideration of the macroeconomic forces that, in combination with the prevailing institutional and policy environment, have induced people to clear more forest. The in-depth analyses in [39] revealed that the granting of community forest rights was closely linked to reduced deforestation and forest degradation. The report stated that such connections were undervalued, as they were rarely made, and often ignored. In fact, the research showed that deforestation rates inside community forests with strong legal recognition and enforcement were dramatically lower than for forests outside those areas. Success stories on reducing deforestation all around the world have been documented and published in [40], and indicate that nearly every success story involved empowering local communities, and decentralizing forest management decisions; using methods such as indigenous reserves, and community forestry management systems.

According to the definition proposed in [41], community empowerment involves all efforts made by a group of people, with or without external support, to be able to continue to develop their capacity or potential for the improvement of their quality of life, independence and sustainability. It can be interpreted as a process that builds community through the development of human or community capacity, changes

people's behaviour, and promotes community organisation. Empowerment of communities surrounding protected areas is defined as all efforts that aim to improve welfare, and increase those communities' participation in all activities aimed at the conservation of natural resources and ecosystems, in a sustainable manner. Such definitions indicate three main objectives in empowering the community, namely: developing the ability of a community, changing their behaviour, and self-organization by that community. Community empowerment is a concept that summarises the economic development of social values that reflect a new paradigm of development, which is principally concerned to be "*people-centred, participatory, empowering, and sustainable*" [4]. Within such a framework, efforts to empower the community in GSKBB BR could be approached in three ways (as enumerated below), in conjunction with initiatives involving all stakeholders of the GSKBB BR that were identified during the FGD process: the private companies that own the large plantation forests, local and central governments, universities, the local communities themselves, research institutions, and NGOs.

Possible approaches could include:

- 1) The creation of an atmosphere that allows the potential within the community to be developed (enabling). This is very much related to the improvement of local community welfare. Here, the point of departure was the recognition that every human being, and every society, has the potential to be developed. In other words, there is no community that should exist without any latent power, because such a community would not be able to thrive. Empowerment is an effort to build such power, by encouraging motivation and raising awareness of individual and group potential, as well as efforts to develop this. In GSKBB BR, the community should be given legal rights to/ownership of their forest, and use of forest products. The ongoing activities included improving access to the utilisation of non-timber forest products, providing legal ownership of certain areas of land, and ensuring that such legal ownership would help in attaining sustainable economic means.
- 2) The strengthening of the potential or power possessed by the people (empowerment). If the community were empowered, they would be able to exploit the potential of their environment, and thus would protect their own land and everything on it. This could help ensure the attainment of forest sustainability, especially in the case of peat-swamp forest. Within this framework, more positive steps would be required, beyond just creating a conducive atmosphere. These should include concrete steps, and involve the provision of various resources, as well as opening access to various opportunities that would make people become more empowered. For example, there should be special programmes for more vulnerable communities (in this case, local traditional community) because generally, many programmes have not always been able to reach this element of society. Empowerment should not only consider the strengthening of individual members of a community, but also its institutions.

Instilling modern cultural values, such as hard work, thrift, transparency, and accountability, is fundamental parts of empowerment. Similarly, essential elements are the reform of social institutions, and their intergradations into development activities, and the role of society in the development. It is important to increase people's participation in any decision-making process that is affecting their forests. It is also important to make the community aware of their traditional rights, so that they are not taken advantage of by other parties; and the government should help in protecting those rights instead of opening access for other people to enjoy them. The NGOs and private companies have encouraged participatory mapping with the local communities to delineate boundaries, and the local government has enacted the Village Regulations concerning local community participation in protecting and preserving GSKBB BR.

- 3) Empowering, with a concomitant element of protection. In the process of empowerment, the weak must be prevented from getting weaker, due to lack of power. This is related to the enhancement of human resources. Therefore, protection and a pro-poor bias should embody the fundamental importance of the concept of community empowerment. Protection does not mean isolating or insulating from interaction, because this would only stunt and weaken the poor. Protection should be viewed as an attempt to prevent unbalanced competition, and exploitation by the stronger of the weaker. The stakeholders were very much involved in building the local communities' capacities to take care of their own surroundings, through activities such as the development of individuals who know about fire and disasters, and the management thereof; enhancing their capacities by improving their economic conditions.

Community empowerment should not cause people to become increasingly dependent on a variety of donations. One example of this potential danger was given in research in [42], which concluded that, after the termination of a community empowerment programme run by the International Conservation Development Project (ICDP) - which basically provided people with aid (in the form of donations) and assistance, the local people had no idea what to do, or who to turn to for assistance. Consequently, they reverted to their 'normal' activities, as carried out before the beginning of the project. Therefore, the ultimate goal is to empower the community, enable and build their skills, so that they can advance themselves towards a sustainable living. Communities in GSKBB BR should be supported through capacity-building activities.

Communities can be created or strengthened as individuals become stronger, physically and/or psychologically, or as groups of people become stronger, i.e. more capable, more powerful and richer (which can be related to the utilisation of local natural resources). In order to be successful in empowering the community, it is important to have some basic understanding of the social organisation, social levels,

and the community itself. It is also important to recognise the relationships between individuals, between individuals and community groups, and between communities ('social capital').

V.CONCLUSION

Deforestation and forest degradation have long been the threats to the sustainability of forest and biodiversity. However, there seemed to be no single solution to tackle the environmental problems, despite the fact that the drivers and the underlying causes of forest change were similar everywhere. It is however, the variables within each underlying causes that are different because they often originated within the local characters, including social, economical, cultural and political. Very often, policy to combat deforestation and forest degradation underestimate the power of the local people, as they were often excluded from decision-making processes and were not given legal rights to their own land. This research provided insights into the potentials of community empowerment in the sustainability of Giam Siak Kecil Bukit Batu Biosphere Reserve on the grounds of the basic success stories of combatting drivers of forest change, in other areas.

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REFERENCES

- [1] H. J. Geist and E. F. Lambin, "What Drives Tropical Deforestation: A Meta-Analysis of Proximate and Underlying Causes of Deforestation Based on Subnational Case Study Evidence," *LUCC Report series No. 4*, 116 pp., 2001.
- [2] H. J. Geist and E. F. Lambin, "Proximate Causes and Underlying Driving Forces of Tropical Deforestation," *BioScience*, Vol. 52, no. 4, pp. 143-150, Feb. 2002.
- [3] A. Agrawal, D. Nepstad, and A. Chhatre, "Reducing Emissions from Deforestation and Forest Degradation," *Annu. Rev.f Environ.Resour.*, vol 36, pp. 373-396, Aug. 2011.
- [4] E. F. Lambin, et al., "The Causes of Land-Use and Land-Cover Change: Moving beyond the Myths," *Global Environmental Change*, Vol. 11, no. 4, pp. 261-269, December 2001.
- [5] A. S. Mather, C. L. Needle, and J. Fairbairn, "The Human Drivers of Global Land Cover Change: The Case of Forests," *Hydrological Processes*, Vol. 12, no. 13-14, pp.1983-1994, Oct. 1998.
- [6] T. K. Rudel, R. Defries, G. P. Asner, and W. F. Laurance, W. F., "Changing Drivers of Deforestation and New Opportunities for Conservation," *Conservation Biology*, vol. 23, no. 6, pp. 1396-1405, Dec. 2009.
- [7] D. H. Boucher, et. al., "The Root of the Problem: What's Driving Tropical Deforestation Today? Cambridge, MA: Union of Concerned Scientists, 2011.

- [8] W. D. Sunderlin and I. A. P. Resosudarmo, "Laju dan Penyebab Deforestasi di Indonesia: Penelaahan Kerancuan dan Penyelesaiannya," *CIFOR Occasional Paper No. 9*, 1997.
- [9] S. Chakravarty, A. N. Dey, C. P. Suresh, G. Shukla, dan S. K. Ghosh, S. K., Deforestation: Causes, Effects and Control Strategies" in *Global Perspective on Sustainable Forest Management*, C. A. Okia, Ed. InTech, 2012, pp. 3-29.
- [10] N. Hosonuma, et al., "An Assessment of Deforestation and Forest Degradation Drivers in Developing Countries," *Environ. Res. Lett.*, vol. 7, no. 4, pp. 1-12, Dec. 2012.
- [11] R. A. Houghton, "Carbon Emissions and the Drivers of Deforestation and Forest Degradation in the Tropics," *Current Opinion in Environmental Sustainability*, vol. 4, no. 6, pp. 597-603, Dec. 2012.
- [12] G. Kissinger, M. Herold, and D. S. Veronique, *Drivers of Deforestation and Forest Degradation: A Synthesis Report for REDD+ Policymakers.*, Vancouver, CA: Lexeme Consulting, 2012.
- [13] S. Wertz-Kanounnikoff, and M. Kongphan-Apirak, "Reducing Forest Emissions in Southeast Asia-A Review of Drivers Of Land-Use Change and How Payments for Environmental Services (PES) Schemes Can Affect them," *CIFOR Working Paper No.41*, 2008.
- [14] P. Antonio, et. al., *Analysis of Key Drivers of Deforestation and Forest Degradation in the Philippines*. Manila, PHP: GIZ, 2013.
- [15] A. Sunkar, *Sustainability in Karst Resources Management: The Case of the Gunung Sewu in Java*, Doctoral thesis, the University of Auckland, 2008.
- [16] Parks & Wildlife Commission of the Northern Territory. *Public Participation in Protected Area Management Best Practice*. Northern Territory, AU: CNPPAM Benchmarking and Best Practice Program 2002.
- [17] K. E. Maani and R. Y. Cavana, *Systems Thinking, System Dynamics: Managing Change and Complexity*. North Shore, NZ: Pearson Education New Zealand: 2007.
- [18] S. R. Kellert, J. N. Mehta, S. A. Ebbin, and L. L. Lichtenfeld, "Community Natural Resource Management: Promise, Rhetoric, and Reality," *Society and Natural Resources*, vol. 13, no. 8, pp. 705-725, 2000.
- [19] K. Brown, "Innovations for Conservation and Management Issues of Prespa National Park," *Hydrobiologia*, vol. 351, pp. 175-196, 2002
- [20] F. Berkes, "Rethinking Community-Based Conservation," *Conservation Biology*, vol.18, no. 3, pp. 621-630, May 2004.
- [21] F. Berkes, "Community-Based Conservation in a Globalized World" in *Proc. of the National Academy of Sciences of The United States of America*, 2007, pp. 15188-15193.
- [22] A. Berghöfer, "Protected areas: The Weakness of Calls for Strict Protection," *GALA-Ecological Perspectives for Science and Society*, Vol.19, no.1, pp. 9-12, Mar. 2010.
- [23] Arnstein, "A Ladder of Citizen Participation," *Journal of the American Planning Association*, vol. 35, no. 4, pp. 216-224, 1969.
- [24] J. N. Pretty, I. Gujit, I. Scoones and J. Thompson. A Trainer's Guide for Participatory Learning and Action. In *IIED Participatory Methodology Series*, 1995.
- [25] T. H. Lee, "How Recreation Involvement, Place Attachment, and Conservation Commitment Affect Environmentally Responsible Behavior," *Journal of Sustainable Tourism*, vol.19, no. 7, pp. 895-915, Sep. 2011.
- [26] J. A. Pooley and M. O'Connor, "Environmental Education and Attitudes: Emotions and Beliefs are What is Needed," *Environ. Behav.* vol. 32, No.5, pp. 711-723, Sep. 2000.
- [27] L. C. Manzo, and D. D. Perkins, "Finding Common Ground: The Importance of Place Attachment to Community Participation and Planning," *Journal of Planning Literature*, vol.20, no. 4, pp. 335-350, May 2006.
- [28] A. J. Walker, and R. L. Ryan, "Place Attachment and Landscape Preservation in Rural New England: A Maine Case Study," *Landscape and Urban Planning*, vol. 86, no. 2, pp. 141-152, May 2008.
- [29] J. J. Vaske and K. C. Kobrin, "Place Attachment and Environmentally Responsible Behavior," *The Journal of Environmental Education*, vol.32, no.4, pp. 16-21, 2001.
- [30] WWF, *Deforestation, Forest Degradation, Biodiversity Loss and CO2 Emissions in Riau, Sumatera, Indonesia*. WWF Indonesia Technical Report: WWF, RSS GmbH, and Hokkaido Agricultural University. 2008
- [31] D. Natria, "Pendugaan Potensi Emisi co2 Akibat Kebakaran Hutan dan Lahan di Provinsi Riau tahun 2012," Bachelor thesis, IPB, 2012.
- [32] S. Ekadinata, M. van Noordwijk, S. Budidarsono, and S. Dewi, "Hot Spots in Riau, Haze in Singapore: The June 2013 Event Analyzed," *ASB Policy Brief No. 33*, 6 p., 2013
- [33] E. Wakker, and de R. Joanna. *Greasy Palms: The Social and Ecological Impacts of Large-Scale Oil Palm Plantation Development in Southeast Asia*: Friends of the Earth, 2004.
- [34] D. Gaveau and M. A. Salim "New Data on Riau Fires Generate Important Insights," *CIFOR Forest Blog*, 2013. Available from <http://blog.cifor.org/17493/new-data-on-riau-fires-generate-important-insights/#.UdYjxDxBOqh>. (Accessed 6 May 2015)
- [35] E. Schlager and E. Ostrom, "Property Rights Regimes and Natural Resources: A Conceptual Analysis," *Land Economics*, vol. 68, no. 3, pp. 249-262, Aug. 1992.
- [36] D. L. Carr, "Proximate Population Factors and Deforestation in Tropical Agricultural Frontiers," *Popul. Environ.* vol. 25, no.6, pp. 585-612, 2004.
- [37] BPS, *Buku Statistik Provinsi Riau*. Riau, ID: BPS-Riau, 2013.
- [38] Valentim, J. F. et al., "Forces Driving Tropical Deforestation", *ASB Policy Briefs No.6*, Nov. 2003.
- [39] C. Stevens, R. Winterbottom, J. Springer, and K. Reyntar, *Securing Rights, Combating Climate Change: How Strengthening Community Forest Rights Mitigates Climate Change*. Washington, DC: World Resources Institute, 2014.
- [40] D. Boucher, P. Elias, J. Faires, and S. Smith. *Deforestation Success Stories: Tropical Nations Where Forest Protection and Reforestation Policies Have Worked*. Tropical Forest and Climate Initiative (TFCI): the Union of Concerned Scientists (UCS), 2014.
- [41] Directorate General of Protection and Nature Conservation (Dirjen PHKA). *Pedoman Kriteria dan Indikator Pemberdayaan Masyarakat di Sekitar Kawasan Konservasi*. Bogor, ID: PjLWA, 2007.
- [42] F. Untoro, *Evaluasi pelaksanaan Kesepakatan Konservasi Desa (KKD) dalam Kerinci Seblat-Integrated Conservation and Development Project (KS-ICDP) Melalui Analisis Stakeholders (Studi Kasus Kabupaten Merangin, Provinsi Jambi)*, Bachelor thesis, IPB, 2006.