

Family Ecological Transaction for Disaster Risk Reduction: Case of Anak Dalam Tribe in Bukit Dua Belas National Park, Air Hitam Regency, Jambi, Indonesia

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Abstract

Anak Dalam Tribe (ADT) is an indigenous community living inside the conservation area, protected as cultural heritage. ADT family is highly dependent on the forest, they used to live and fulfill all their needs from the forest. Now with the modernization and regulatory dynamics taking place, ADT family undergoes changes as a form of adaptation, leading to residing categorization i.e. traditional, transition, and bediom. The changes impact on the ecological transactions thus bring a greater potential risk of forest fires, as has happened in recent years. This study aims to discover ADT family ecological transactions based on their residing type so that potential environmental exposure can be predicted and anticipated for disaster risk reduction. The qualitative research was conducted using a cross-sectional method. Data were collected through in-depth interview, observation, and forum group discussion. Mapping was done to understand the transaction pattern. This study found that the pattern of each kampong was different, showing that development has happened following the socio-ecological changes of each kampong, either by nature or intervention from outside parties. However, the livelihood area is still the biggest and outermost area of all six kampongs despite the residing type, covering the forest area. Moreover, the area of exposure is enlarged. It vindicates the escalating disaster risk. It is suggested to create a holistic livelihood ecosystem for ADT near their residing place to minimize the disaster risk. Political identity of ADT also should be reconsidered, with the inevitable global development, how far the heritage should be kept.

Keywords: socio-ecological system; indigenous people; disaster risk reduction; family ecology

Introduction

Humans as the part of ecosystem are dependent on nature. Nature provides people everywhere with multiple benefits that help maintain their quality of life. However, some population groups more directly and immediately depend on locally available nature to satisfy basic needs than others. The benefits derived from nature are indispensable for these population groups who lack the assets needed to escape poverty (Bennett et al., 2015). For many others, nature represents an irreplaceable cultural value (Díaz et al., 2018). Other study explained nature-dependent people as people who directly rely on locally available natural resources to fulfill their basic needs (Fedele et al., 2021). The dependency between humans and nature is explained in the ecology family.

Family is the smallest unit and community builders that affect and are affected by their environment (B.T., 2021; Chin et al., 2020; Edwards et al., 2012; Keil et al., 2021; Sunarti et al., 2019). In sociology, a family is viewed as the smallest social unit in society. Ecology family as science has grown since the 19th century regarding the happening of social reforms, expansion of public education, industrialization, urbanization, and attention to the health and



welfare of families. The concept of family ecology is built from linkages and inter-dependency among families, and between families and their environment (Sunarti et al., 2019). The perspective of ecology family regained its attention in the 1960s in line with the rise of awareness that there are linkages and dependencies between human behavior and their environmental conditions, and the development of interest to observe family phenomena as a holistic unity (system)(Bubolz & Sontag, n.d.). Basic moral values of family ecology are that humans need to live side by side with other human beings within a specific social environment desiring to gain a better life, that there are interdependency between humans and nature.

Bukit Dua Belas National Park (BDNP) is a conservation area in Sumatera Island, Indonesia. With an area of more than 54,780 hectares, BDNP is the home of diverse high-valuable flora and fauna. The management of the BDNP is regulated in the regulation of the Minister of Forestry of the Republic of Indonesia. The regulation clearly stated that the BDNP management aims to: 1) protect, maintain, improve, and preserve the Lowland Tropical Rain Forest area which holds a high diversity of flora, fauna, and ecosystems and is threatened with extinction; 2) protect and preserve the habitat of life and culture of ADT who have long been in BDNP area; and 3) protect, preserve, and expand medicinal plants which are a source of livelihoods. ADT is one of the Indonesian indigenous people that still exists. ADT people have been lived in the forest, long before the BDNP was formed, thus ADT families given the right to live inside the national park. ADT families stayed inside the forest and fulfilled all their needs from the forest so their socioecological transactions with nature are very high. However, with the increase in population and other needs, over time the resources to support community life in the forest are depleting. Recent data shows that many forest resources are decreasing, such as forest animals that they hunt such as wild boar, anteaters, and other forest animals as well as reduced non-timber forest products such as dragon blood, rattan, resin, and so on (*Organisasi Sosial Suku Anak Dalam (SAD)*, 2021). This creates problems for ADT families because the source of income decreases while the needs increase and increase as the number of ADT families increases. Along with the modernization, population growth, modernization, and the dynamics of forest resource management regulations, the transaction pattern of the ADT community with the forest has begun to change. The following is a description of the three residing types of ADT families (Wandi, 2019), namely:

1. Traditional, for ADT families living in the BDNP area. This community is still closed or has very limited interaction with outside community groups. Communication can only take place through jenang or landlady. This group has Animism, Dynamism, and Polytheism beliefs;
2. Transition, for ADT families who temporarily stay in the BDNP for a certain time by making temporary shelters (sudung). This group has made efforts to cultivate crops around their place of residence (the corner), and other sources of food are obtained from hunting in the middle of the forest and oil palm plantations. This group already has open social interaction with the outside community;
3. Bediom, for ADT families who have settled, live in the house and live like villagers. The ADT community already has a source of income like village people or transmigrant residents, namely farming even though they use simple technology. Commodities developed are rubber and oil palm. As is customary for the Jungle People (ADT), apart from planting rubber and oil palm, they are still actively hunting in the oil palm plantations. This sedentary ADT community has open social interactions and embraces Islam.

These changes cause an increase in the potential for forest destruction, moreover forest fire. In BDNP, forest fire usually managed by the national park. ADT's family and community see the forest as their home and will not intentionally do things that according to local beliefs and wisdom will cause disaster. However, how ADT carries out disaster mitigation with knowledge inputted from outside parties is an important issue to raise. Increasing awareness of disaster risk issues, mitigation, and prevention actions needs to be encouraged by external parties and this begins with the issue of disaster risk reduction.

Various studies suggesting the importance of integrating disaster risk reduction in regular development and people's lives (Sunarti et al., 2018, 2021; Sunarti, Johan, et al., 2022; Sunarti, Meliano, et al., 2022; Tatsuki, 2007) need to be followed up in identifying community vulnerabilities that can interact with threats and improve disaster risk. Reports indicate a decrease or degradation of nature and environmental capacity which increases the vulnerability of the community. One of the cases related to this is the decline in the carrying capacity of the environment as a source of livelihood for the Anak Dalam tribe who live in the Bukit Dua Belas National Park, Sarolangun Regency, Jambi Province, Indonesia. BNPB data shows that Sarolangun Regency is at risk of forest fire (Adi et al., 2022). Family ecology should and very important to applied in disaster risk reduction efforts, especially for ADT as indigenous community who live detached from modern society as family is the strongest bond in this community, also that local wisdom and indigenous knowledge is passed down from generation to generation from parent to children in indigenous community. Therefore, this study aims to depict the current life of ADT families and discover ADT family ecological transactions so that potential environmental exposure can be predicted and anticipated for disaster risk reduction.

Methods

Sample and Sampling

The unit of analysis for the study was a family, which came from three villages (Lubuk Jering, Pematang Kabau, and Bukit Suban) in Air Hitam District which is within the Bukit Dua Belas National Park (BDNP) area. There are 2,960 people from the ADT group who occupy an area of 54,780.41 hectares (Balai Taman Nasional Bukit Duabelas, 2018). Air Hitam sub-district is the center of the Anak Dalam Tribe group, so it was chosen as the study location. To obtain an overview of the three groups of the ADT families' residential patterns, Lubuk Juring Village, Pematang Kabau Village, and Bukit Suban Village were selected as study locations. The unit of analysis is the family group according to occupancy, so 6 kampungs are selected, i.e. Sako Selensing (traditional), Ujung Doho (traditional), Kampung Madani (transition), Air Panas (transition), Kutai Ujung (bediom), Singosari (bediom). As much as 30 families participated in this study, 5 families for each kampong or 10 families for each residency type. The criteria for participants were compiled from Rubin and Rubin (2005) i.e. knowledgeable and experienced in the issues under study; representing a range of points of view (supporters, opponents, undecided) and groups (gender, age, wealth, origin); and demonstrating a willingness to talk.

Study Design

Design of this study is cross-sectional. This study used a qualitative approach in which the main method used was a conversation with a purpose (Burgess, 2002), i.e. semi-structured in-depth interviews in an informal setting, where issues of concern are raised in a natural sequence under the flow of conversation. Interview conducted in participants house accompanied by ADT key person. Informed consent was asked firstly before interview were carried. In selecting participants, we used snowball sampling (Goodman, 1961) which is went to houses of ADT families. The criteria for participants were compiled from Rubin and Rubin (2005) i.e. knowledgeable and experienced in the issues under study; representing a range of points of view (supporters, opponents, undecided) and groups (gender, age, wealth, origin); and demonstrating a willingness to talk. Other primary data were collected through observation and focus group discussion with key informants consist of ADT key persons i.e. Tenggani and Tumenggung, important figure in Air Hitam District, BDNP office staff, and NGO involved in ADT people.

Socio-ecological Transaction Indicators

Basic moral values of ecology families were found in the idea of interdependency between humans and nature. From its perspective, families transact with nature to fulfill their needs. This study observed ADT families, indigenous community who are highly dependent on nature. Previous studies explained that basic human needs are claimed to be universal, they can be satisfied differently depending on culture and time (Doyal & Gough, 1984). The known Maslow's theory categorized human needs into physiological needs (food, water, warmth, rest),

safety needs (security, safety), belongingness and love need (intimate relationships, friends), esteem needs (prestige and feeling of accomplishment), self-actualization needs (achieving full potential) (Allam & Jones, 2018). The Millennium Ecosystem Assessment (Millenium Ecosystem Assessment, 2005) stated that nature can contribute to all the components of human well-being, especially basic material for a good life, such as sufficient food and water, shelter, and adequate livelihoods and income. This is following a study from (Díaz et al., 2015) that stated that the multidimensional perspectives of human well-being include material, non-material and intrinsic values. While MPI mentioned only three dimensions: health, education, and living standards (Alkire & Santos, 2014). Study of Fedele et. al (2021) used four dimensions to measure nature-dependent people relations i.e 1) housing materials, 2) drinking water, 3) fuel for cooking (energy), and 4) main occupation. Previous study results and theory mentioned are resemble one another which explain that in principle, human needs are include basic need, secondary need, and tertiary needs. Following, transaction aspects studied in this research are categorized in 3 components, named 1) physiological needs i.e. food, shelter, and water (for drink, hygiene, and bladder), 2) livelihood, and 3) instrumental needs i.e health, education, and religiosity. These indicators were chosen based on the importance of supporting basic human needs, information availability, comparability across all the surveys used, and compatibility with ADT as a unique community.

Mapping and Geospatial Analysis

This study intended to observe socio-ecological transactions spatially. Mapping was done by tagging locations where ADT families carry out their daily activities, by taking photos with geographical coordinate stamps. Data obtained are categorized according to the indicators, then simply analyze using Google Earth. In the field survey, many locations cannot be accessed due to the difficult track and great distance. For example, ADT families could walk for 10-12 hours for animal hunting or gathering dragon's blood. In such cases, spatial info will be generated from the in-depth interview with the ADT family. Hence, spatial data from this qualitative research is underestimated. The real potential subsistence area is wider, so the potential for nature exposure is greater. This should be minded with respect to study results.

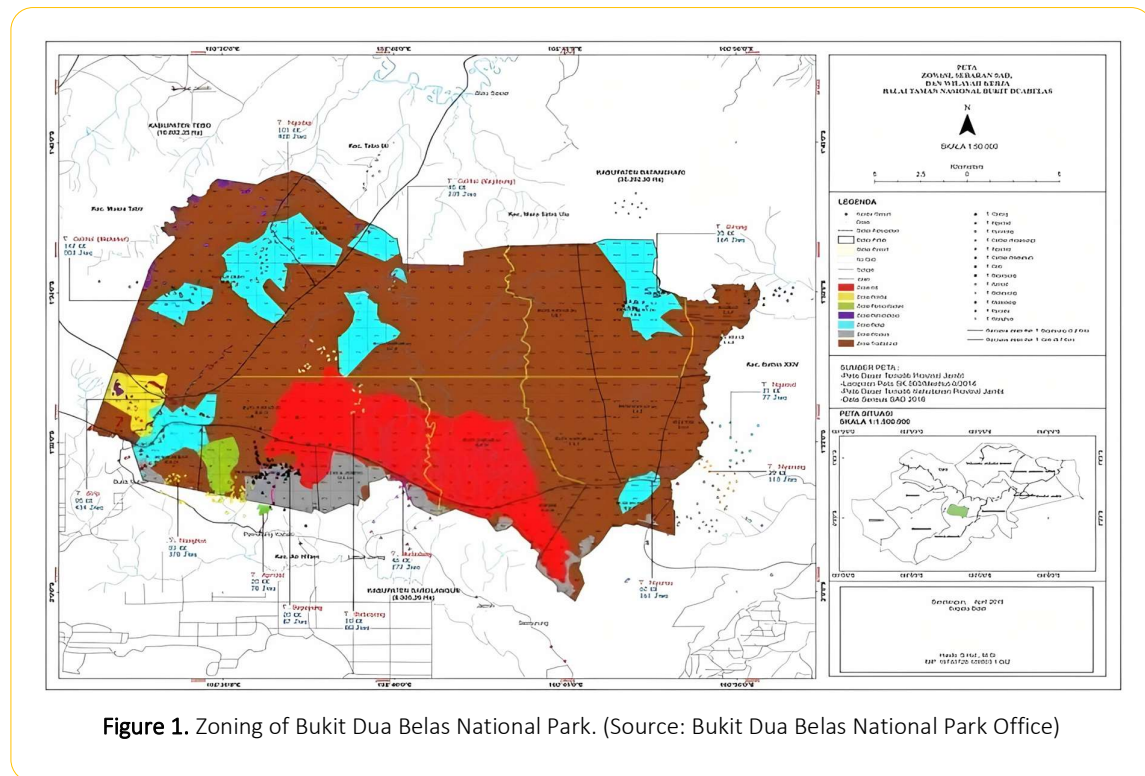
Results and Discussion

The Indigenous Community: Anak Dalam Tribe

The ADT family ecosystem as an indigenous community is enticing because of their traditional way of life. They are known for their way of life that moves from one area to another in the forest in groups and utilizing forest products through hunting and gathering various forest products. ADT community spreads to several districts such as Tebo, Bungo, Muara Jambi, Merangin, and Sarolangun Regencies (Wandi, 2019). The existence of ADT as an indigenous community is officially recognized through national regulation and their needs are officially accommodated in the BDNP spatial regulations, the official zone map of BDNP is presented in Figure 1, where the ADT zone is in the periphery of the red color. In addition, the existence of the ADT community in the forest as a place to live and livelihood is also strengthened by the BDNP policy contained in the Long Term Development Plan, it is stated that the BDNP aims to preserve natural resources and BDNP ecosystems that support the life and welfare of the ADT as well as the surrounding community as one of the sustainable conservation object (Balai Taman Nasional Bukit Duabelas, 2017).

The ADT people or also usually called Orang Rimba live in groups and are led by a traditional head called Tumenggung. They are free to live with other groups but do not easily change groups because there are customary laws that govern them. In its development, the social institutions of the Orang Rimba have also changed. Some groups easily split from their group and form new tumenggung because of incompatibility with the old tumenggung (Balai Taman Nasional Bukit Duabelas, 2017). However, the main ADT activity is taking place within the family, the smallest unit of community. Every change in the lifestyle of the ADT group has consequences for family life. Especially in the ADT community who have settled outside (Bediom), the family's position in relation

to the community becomes stronger. The ADT family, although they are still wandering, are also affected by various social, economic, ecological, and, without exception, political changes. ADT families face a variety of changes, problems, and challenges so the resilience of ADT families becomes increasingly relevant to explore, photographing, and understanding the current dynamics. It is hoped that the results of a study on the resilience of ADT families will become material for recommendations on the empowerment and development of ADT families.



Though ADT is an "exclusive" community who lives on their own, ADT is not free from exposure to various changes from outside the ADT community that enter or are brought in through various channels. One of the important responses to these changes was the decision to change residence, either because of an independent decision or because of the housing program provided by the Ministry of Social Affairs. The decision to change residence brings other changes such as dressing, use of household items, means of communication and transportation, and even changing religions.

The ADT has a lifestyle and beliefs that are unique and different from modern society. ADT views the forest as their place of residence, so they are very concerned about forest sustainability. The view is that forests are shared property so that anyone can use them (Isyaturriyadhah, 2019). This increases the disaster risk in BDNP. Thereafter, the results of the previous study show that the current existence of ADT children in the forest has different views (Wandi, 2019), first: there are different perceptions regarding territorial claims between the state, companies, local villagers, and the ADT. Second, there is a conflict of interest in the utilization of forest resources that were previously home to the ADT. Third, there is competition in the utilization of forest resources. Fourth, it is a dilemma for the ADT in the midst of the changing times, where they have lived for a long-time colliding with policies that are oriented towards group interests.

Research in 2020 shows that the empowerment of Orang Rimba has a different perspective from each institutional group. The state interprets empowerment as "modernization" by means of resettlement and uses an economic approach as an indicator of the success of a program. Then, NGOs interpret empowerment as a process

of building critical awareness by organizing alternative education and advocacy, while Corporate groups carry out empowerment through CSR activities (Muchlis & Sardi, 2022). In 2021, integrated and sustainable research on the empowerment of the Orang Rimba in the Bukit Dua Belas National Park has produced several records. First, economic empowerment through exploration and utilization of medicinal plant biodiversity, through inventory and processing of medicinal plants with economic value; and training and construction of plantation and forestry plant demonstration plots and specific plants endemic to the BDNP. Second, the development or innovation of the ADT education system through the development of curricula, modules, and the initiation of community learning activity centers (Muchlis et al., 2021).

Several solutions have been made to improve the standard of living of the tribal people. In 1999, Saur Marlina Manurung established a jungle school in the forest area of Bukit 12 National Park as a place to study the Anak Dalam tribe (Manurung, 2013). Empowerment of remote indigenous communities (KAT Program) for the Anak Dalam tribe has also been carried out by the Ministry of Social Affairs in Ilir District since 2007. The KAT program for the Anak Dalam tribe starts from pre-conditions, providing living ration assistance, and work equipment, providing fish and secondary crops, providing agricultural land, building residential houses up to the construction of social halls, and assistance for the construction of five kilometers of roads. The Ministry of Social Affairs has inaugurated 50 houses for the Anak Dalam tribe so that they no longer live sedentary lives (Social Ministry of The Republic Indonesia, 1998). However, the various efforts that have been made to improve the standard of living of the Anak Dalam tribe have not obtained maximum results, even the Anak Dalam tribe community does not want to accept this solution that has been offered. One of the reasons is that communication patterns still need to be improved. The pattern of empowerment so far has had negative impacts on the inner child tribe itself, such as being self-sufficient, materialistic, and causing conflict, both internally within the inner child tribe and with outsiders.

Socio-ecological Pattern

This study observed how ADT families interact with nature. It is found that the pattern of each kampong was different (Figure 2), showing that development has happened following the socio-ecological changes of each kampong, either by nature or by intervention from outside parties. Yet, the livelihood zone is the biggest and outermost of all kampongs. It showed that the intensity of the interventions affects how varied the socio-ecological pattern changes. Physiological needs are usually inside the livelihood area, except in Kutai Ujung because currently ADT people traditional market located in the center of the village to fulfill their food needs. Beside, the livelihood area of Kutai Ujung is relatively smaller than other kampongs because most of ADT people in Kutai Ujung rarely gather things in the forest, yet plant oil palm supported by outside parties. Instrumental needs area are provided except in Sako Selensing due to the government didn't build the facilities for Sako Selensing because they are still live far inside the forest. Furthermore, the socio-ecological transaction of ADT families is explained in Table 1.

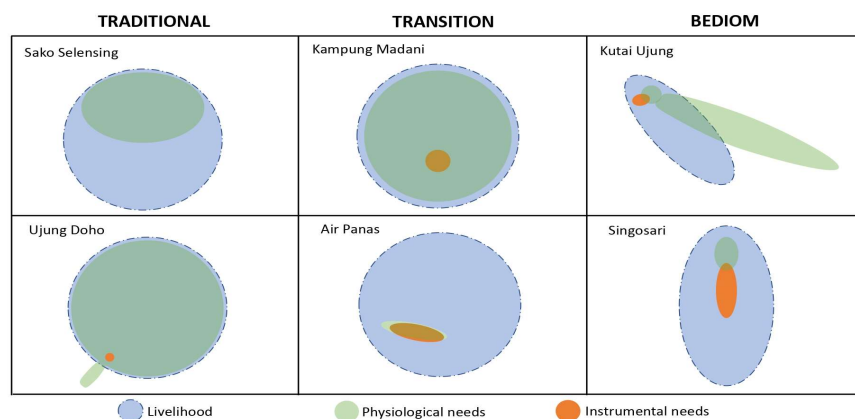


Figure 2. Socio-ecological pattern of ADT families.

Sako Selensing and Ujung Doho are kampongs categorized as traditional ADT families. Both are obtain food mostly by hunting wild boar or other wild animal in the forest and sometime buy food from near local traditional market. Husbands could go to the forest for days for hunting and at the same time gathering dragon blood, betelnut, or latex gun which located far inside the forest. They live in stilt houses made from wood or sudung, a tarpaulin roofed house without walls which looks more like gazebo. They didn't have bathroom or sanitary tools at home, so they collect rain water for wash and toilet needs that done in bushes around house. They bath in the river where located kilometers away from their houses. ADT families in Kampong Madani, categorized as transition, is quite the same, unless they didn't hunt wild animals as much as traditional ADT and obtain their food from peddlers due to the long distance to the traditional market. ADT families in Air Panas (transition), Kutai Ujung (bediom), and Singosari (bediom) usually obtain their food at the traditional market. Most of them are also use bathroom for urinate, defecate, and bath, either in their own house or in communal bathroom built by the government. ADT families in Air Panas seldomly hunt wild boar for food while ADT families in bediom kampongs are rarely hunting anymore. ADT transition families still make a living from gathering dragon blood, betelnut, and latex gum in the deep forest. While livelihood of ADT families in bedroom kampongs are more modern.

Table 1. Socio-ecology Transaction of ADT

| Kampong | Residing Type | House | Food Source | Bath, wash, toilet | Livelihood | Infrastructure |
|----------------|---------------|---|--|--|--|---|
| Sako Selensing | Traditional | Stilt house from wood sized 4x10m and sudung (far away from other houses) | Traditional market, hunting in forest (wild boar, etc) | Bath: in river Urinate & defecate: house yard/bushes by collecting rain water | Gathering dragon blood, betelnut, and latex gum | None |
| Ujung Doho | Traditional | Sudung | Traditional market, hunting in the forest (wild boar, etc) | Bath: in river Urinate & defecate: house yard/bushes by collecting rain water | Gathering dragon blood, betelnut, and latex gum | Unofficial School (functionate) |
| Kp. Madani | Transition | Stilt house from wood sized 8x10m (far away from each other) | Peddler | Bath: in river Urinate & defecate: house yard/bushes by collecting rain water | Gathering dragon blood, betelnut, and latex gum | School, library, small healthcare center, communal bathroom (unused), communal building |
| Air Panas | Transition | Modern house (brick-cement) sized 16x10m | Traditional market | Inside the house and communal bathroom | Gathering dragon blood, betelnut, and latex gum, oil | Mosque, church, kindergarten, small healthcare center |

| | | | | | | |
|-------------|--------|---|--------------------|--|--|------------------------------|
| | | (adjacent houses) | | | palm farm, peddle | |
| Kutai Ujung | Bediom | Modern house (brick-cement) sized 8x10m (adjacent houses) | Traditional market | Communal bathroom | Oil palm farm | Mosque, church, kindergarten |
| Singosari | Bediom | Modern house (brick-cement) sized 8x10m (adjacent houses) | Traditional market | Inside the house and communal bathroom | Mostly worker, some from oil palm farm and latex | Mosque, kindergarten |

Disaster Risk Reduction

Disaster Risk Reduction (DRR) is all efforts made to reduce disaster risk. This can be done by analyzing the causal factors of disasters, reducing exposure to hazards and risks, and minimizing the vulnerability of communities and their livelihoods (International Organization for Migration, 2010). DRR involves a complex process that includes an investigation of the root causes of problems and vulnerabilities, whether physical, social, economic, or environmental. DRR in a comprehensive development plan includes (1) regular disaster risk assessments; (2) there is a map of hazard, vulnerability, capacity, and resources; (3) there is a database of elements at risk; (4) the integration of disaster mitigation measures into the Comprehensive Land Use Plan and Annual Investment Plan; (5) there is an update on zoning regulations, safety regulations, environmental regulations, environmental policies; (6) the involvement of non-governmental organizations (NGOs), people's organizations, youth, religion, business, and other sectors (including indigenous peoples, and others); (7) carry out hazard mapping, risk profile/

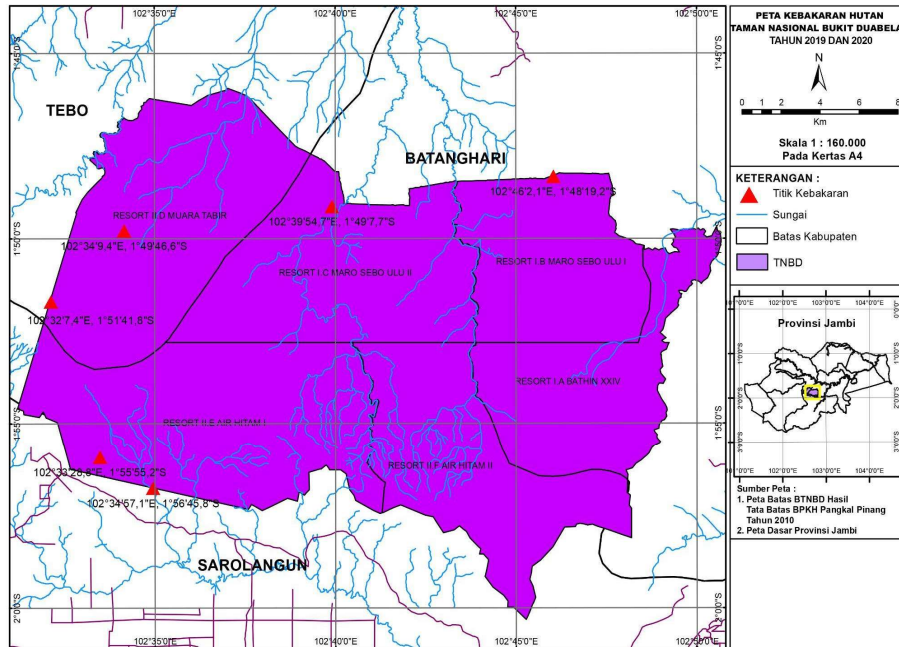


Figure 3. Case of forest fires in BDNP in 2019-2020. (Source: Bukit Dua Belas National Park Office)

community-based monitoring system, construction, building integrity evaluation; and (8) determine the provisions on settlement boundaries in disaster-prone areas (Gabriel et al., 2021).

The main potential natural disaster in BDNP is forest fires. Forest fires are disasters that have a large impact on forest resources, human life activities, and damage the global ecological balance (Zhang et al., 2019). Forest and land fires could be caused by natural and human factors. Natural factors that affect forest and land fires i.e land factors and climate factors. For human factors, the causes are usually the community's habit of burning in preparing their fields, land clearing, and smoking in the forest. The low level of welfare and education of the people around the forest is also a factor in the occurrence of forest and land fires (Sunarti et al., 2009). Figure 3 showed forest fire incidents in 2019 and 2020.

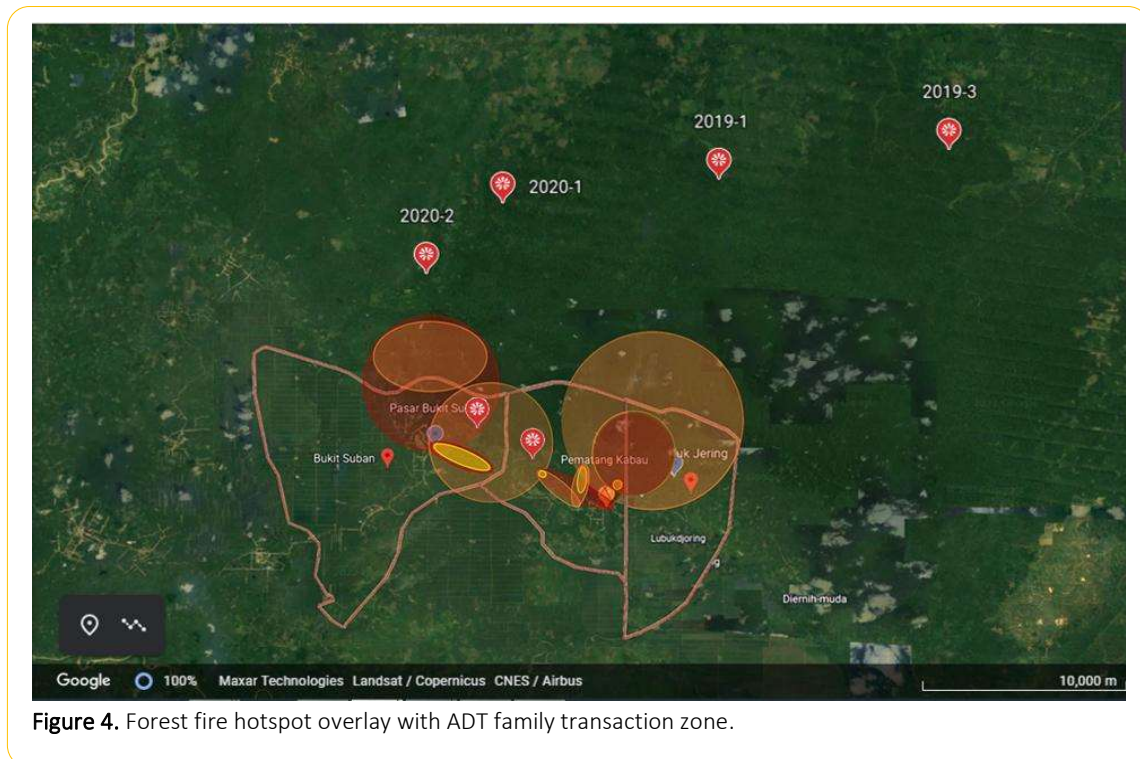


Figure 4. Forest fire hotspot overlay with ADT family transaction zone.

Then, the map is overlaid with the ADT families transaction zone (Figure 4). The dot showed the location where forest fires occurred while the number next to it means the year the fire happened. The transaction zone showed by the circle and oval area colored in red, orange, and yellow, as shown in previous Figure 2. The red line showed the border of villages studied. The figure showed that there are two points of occurrence of forest fires that occurred inside the ADT families transaction pattern zone. Considering that: 1) the population of ADT families continues to increase, 2) thus the need for food and sources of livelihood also rises, 3) the carrying capacity of nature is decreasing (wild boars are increasingly difficult to find, and the natural resources adjacent to ADT houses are lessening), 4) the wider range of ADT families exploring the forest and clearing land for access or plantation, 5) ADT families have started using motorcycles, including to explore the BDNP forest, 6) smoking habits, 7) the existence of oil palm plantation and rubber trees in the forest which are the source of livelihood of ADT families, it is expected that the potential for natural exposure and forest clearing is getting higher. Therefore it is urgently necessary to have proper family empowerment concerning the provision of a livelihood ecosystem for ADT, so that the ADT livelihood pattern does not encroach on the forest.

The factual existing development programs for ADT, especially from the government, mainly focused on modernization such as providing permanent housing, providing bathrooms, educational facilities, and health facilities, yet has not accommodated the livelihood aspect. The livelihood ecosystem is crucial in the development and stability of family resilience. Development of family programs that are not optimal and comprehensive can increase disaster risk because ADT families have undergone modernization but still have a high dependence on forests. This causes the area of natural exposure to expand with higher interaction intensity and more sophisticated equipment.

Recommendation

Suggestions and recommendations for empowerment programs for ADT families are creating a holistic livelihood ecosystem for ADT families near their residences. Making a livelihood ecosystem must be solutive and comprehensive. It is recommended to support ADT families with oil palm plantations adjacent to their houses and provide channels for product marketing and selling. For bediom ADT families who have worked in private sector as employees etc, it is necessary to provide a capacity building that can improve the skills and qualifications. Further, programs related to identity politics in ADT families need to be reconsidered. How far the "indigenous" should be kept amidst the modernization and globalization happening in this world? Should we deliberately let ADT families live in poverty to sustain their heritage? It is better for the government and NGOs to continue to maintain the identity of "Suku Anak Dalam" as a heritage but also maintain the welfare of ADT families. If the ADT family's welfare is prosperous, then the forest will also be protected.

Conclusions

The findings in this study enrich the literature on the socio-ecological system and land-use pattern of indigenous people, especially Anak Dalam Tribe or Orang Rimba, because description and analysis about indigenous people are still rare and each indigenous people is unique. Originally, ADT as indigenous community have their own way of adapting to environmental changes. This study highlights the importance of understanding the unique socio-ecological patterns of the ADT and developing appropriate strategies to empower them while protecting the forest.

ADT families who live in the BDNP are still part of the Indonesian population who have the same rights to progress, develop, and enjoy the results while contributing to development. In the past, the entire ADT community was a nomadic community with shifting cultivation occupying the BDNP area. Nowadays, there are already settled and semi-sedentary ADT communities. This shows that changes have occurred in ADT communities. Thus, it is necessary to seek appropriate empowerment strategies to accelerate change so that families and communities have a quality life and the ADT livelihood pattern does not encroach on the forest. This is including stability in lifestyle and livelihood patterns as well as housing and shelter, in terms of achieving SDGs.

This study found that the pattern of each kampong was different, showing that development has happened following the socio-ecological changes of each kampong, either by nature or by intervention from outside parties. Yet, the livelihood zone is the biggest and outermost of all kampongs. It showed that the intensity of the interventions affects how varied the socio-ecological pattern changes. Changes are still and continue to occur to this day, increasing exposure to nature and escalating disaster risk i.e forest fire. It denotes that outside intervention could be a double-edge sword. ADT as indigenous community cannot be compared to modern society, thus disaster risk management policies and programs should respect and consider indigenous values. Governmental programs should be based on mutual understanding and collaboration so that comply the indigenous way of life. Creating a holistic livelihood ecosystem alongside the kampongs is one of DRR action by narrowing the transaction zone and lower disaster risks. Furthermore, political identity of ADT should be reconsidered. With the inevitable global development, how far the cultural heritage predicate should be detained.

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