

Empowerment based peatland ecosystem conservation for fire control and environmental conservation

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ABSTRACT

Peat ecosystems are a hydrological buffer and carbon stock that is very important for the environment. This ecosystem must be protected through conservation so that its function can be maintained. Conservation of peatland ecosystems means that emissions of very large amounts of carbon can be minimized. Conservation of peat areas in several places is increasingly important because it tends to decrease peat lands. Peatland conservation in Indonesia is regulated in Presidential Decree No. 32 of 1990 concerning protected areas. Protection of peat areas is intended to control the hydrology of the area, which functions as a water store and prevents flooding, as well as protecting the unique ecosystems in the area concerned. Peatlands have hydrological, biogeochemical, biodiversity protection and forest product production functions. Peat is also useful for preventing drought, flooding and mixing saltwater for irrigation in agricultural areas. But the benefits are lost because the peatlands are burning. Therefore, peatlands must avoid fires through the empowerment-based ecosystem conservation. The community empowerment approach becomes a strategic choice because in its implementation process it has optimized community participation, trying to improve the community's ability to analyse conditions and the potential and problems that occur around peatlands. The empowerment approach also can formulate priority program options that are relevant to program objectives including fire control and environmental preservation. Conservation of peat land ecosystems based on empowerment means carrying out a conservation process by involving the community for the purpose of aid effectiveness, increasing the potential of the community, and increasing community contributions towards a sense of ownership and a sense of responsibility towards the sustainability of the program. Fire disasters in some parts of Indonesia are still a serious threat, as well as peatland shrinkage. The current study seeks to find evidence and solutions through descriptive qualitative studies in the provinces of East Kalimantan, North Sumatra and Aceh. The results of the study confirm that conservation of peatland ecosystems based on empowerment is a strategic approach.

Key words: Conservation, Ecosystems, Peatlands, Fire, Empowerment

Introduction

Peatland ecosystem conservation can be grouped into three categories namely reducing deforestation, controlling water levels, and preventing forest and land fires. Conservation efforts can be emphasized

for the purpose of: 1) protecting forests that grow over peatland areas; 2) determine a certain area to be managed as a representative of peatland ecosystem conservation; and 3) take action by utilizing the principles of conservation in a planned and consistent manner.

Systematically, the purpose of peatland conservation is to: 1) tackle forest and peatland fires; 2) replanting with high-carbon fastening plants (tree crops); 3) ground water level regulation; 4) utilizing abandoned land; 5) strengthening the importance of monitoring the use and management of peatlands through policies and regulations; and 6) empowering peat ecosystem conservation groups.

The empowerment approach in the process of conserving peat ecosystems is a strategic choice because it can optimize community participation in program management, starting from the planning, implementation, utilization and maintenance stages, to evaluation monitoring, to the development stage. The empowerment approach is also consistent with the principles of education, optimizing local potential, optimizing contributions, and trying to foster a sense of ownership of the program for the purpose of program sustainability.

The empowerment approach is oriented towards increasing the knowledge, skills and good behaviour of the community through the formation of groups based on local wisdom. The formation of community groups focused on conservation is a medium for developing and empowering together.

Peatlands are important for biodiversity because they are home to ecosystem life. Peat swamp forests have multiple functions, such as hydrological, biogeochemical, biodiversity protection and production of forest products. Peat is also useful for preventing drought, flooding and mixing saltwater for irrigation in agricultural areas. But the benefits are lost because the peatlands are burning.

If the peat forest is disturbed or burnt, then the peatland will change its function from an absorber to a source of greenhouse gas emissions (Agus and Subiksa, 2008). Greenhouse gases (GHGs) released (emitted) from peatlands are CO₂, CH₄ (methane), and N₂O. Among the three gases, CO₂ is the most important GHG because the amount is relatively large, especially from peatlands that have changed function from forests to agricultural land and settlements. The amount of emissions from peatlands for a certain time interval can be calculated based on changes in carbon stored on peat soils.

Empowering observers oriented to the environment and peatlands, including the Ministry of Environment and Forestry of the Republic of Indonesia, have sought to analyse and create a peat ecosystem protection program in which there is infrastructure development such as s canals on a number of canals

or trenches in peatlands, group formation non-governmental organizations oriented to fire management and conservation of peatland ecosystems.

It is certain that almost all peat ecosystem control programs are well and systematically designed, but in their implementation, they often face various problems, both related to technical and non-technical aspects. Efforts to find more effective and efficient solutions are a joint agenda, one of which is through descriptive qualitative studies.

Review Literature

Peat and Peat Ecosystems

Peat is part of the ecosystem and assets owned by Indonesia. Peatlands are wetland ecosystems characterized by high accumulation of organic matter with a low decomposition rate. From 40 million hectares of tropical peatland. An area of 50% is found in Indonesia or about 10.8% of the total land area of Indonesia. Peat is organic material that is formed naturally from the remnants of plants that are imperfectly decomposed and accumulated in swampy areas that are saturated with water for thousands of years ago.

Ecosystem is an ecological system formed by an inseparable interrelationship between living things and their environment. Ecosystems as a whole and comprehensive unity arrangement between all elements of the environment and mutual influence. Peat Ecosystem is a structure of peat elements (biotic and abiotic) which is a whole and comprehensive unit, which influences each other in shaping balance, stability and productivity. Peatland ecosystem is a unique ecosystem with a very high diversity of flora and fauna and is unique. It is realized that peat swamp forest is a vulnerable ecosystem. Peat ecosystems are only able to accommodate relatively few species (on average no more than 15% of local flora and fauna) but have highly specialized dominating species (Minayeva *et al.*, 2016).

Most of the peatlands in Indonesia are now experiencing alarming damage as a result of activities that are lacking or not environmentally sound. The activities that most because problems are burning peatlands in the context of preparing agricultural land, plantations, settlements, uncontrolled logging of peat forests, and construction of irrigation channels / ditches / canals for agricultural and transportation purposes. All of these activities not only cause

physical damage to peatlands / peat forests and a reduction in the extent of peatlands, they also cause loss of the function of peat as carbon sinks and absorbers; loss of function of peatlands as water catchment areas that can prevent flooding in the surrounding area during the rainy season.

Bambang from the Bogor Agricultural Institute (IPB) emphasized that peatlands are one of the most vulnerable locations to burn. Fires on this land are difficult to extinguish, especially if they occur at the subsurface. Unlike the fires on the surface of the land that are clearly visible, the spread of fire at the bottom is not detected. Extinguishing is even more difficult because the fire spread below the land surface. Fires below the surface of peatlands occur if the water level is not high enough. The land becomes dry, not sufficiently wet so that it can catch on fire, even burning the dry peat inside. As a result, the fire spread more easily.

Bambang further asserted, the smoke caused by fires that occur in the inner layer of peat is more dangerous. Gas emissions from fires in peatlands consist of 90 types of gas. 50 percent of the gas is poisonous. It is very important to keep the peatlands wet. Surface fires will not penetrate wet peat. That way, forest and land fires will not be widespread. Well-moistened peat can reduce the possibility of widespread peatland fires.

Peatlands in Indonesia are spread on the islands of Sumatra, Kalimantan, Sulawesi and Papua. Polak (1952) first mentioned the estimated area of peatlands in Indonesia reaching 16,350,000 hectares. The Department of Mines and Energy (1989) estimates that Indonesia's peat area is 17,000,000 hectares with an estimated reserve of 170 billion cubic meters of peat, assuming an average thickness of 1.0 meters.

In 2005, Wetlands International estimated that there were around 20,600,000 hectares of peatland in Indonesia. Wahyunto (2005) emphasized that overall peatlands in three islands (Sumatra, Kalimantan and Papua) with thickness > 3 m around 5,301,100 hectares (35.6%). In Kalimantan 44.1%, and in Sumatra 55.9%. The distribution of peatlands in Sumatra included 2,449,652 hectares in Riau, 386,557 hectares in Jambi, 71,430 hectares in Aceh, 64,862 hectares in West Sumatra, and 41,627 hectares in South Sumatra.

In Kalimantan, almost all its peatlands include deep peat (> 60%). 26.2% of them are in West Kalimantan Province. Peat data published by the

Indonesian Centre for Agricultural Land Resources (Ritung *et al.*, 2011) covers an area of 14,900,000 hectares. Whereas the Indonesian Centre for Agricultural Land Resources and the Indonesian Centre for Land Research in 2011 estimated that there were around 14.9 million hectares of peatland. Of the 14.9 million hectares, 6.4 million hectares (43%) are located on the island of Sumatra; 4.8 million (32%) are located on the island of Kalimantan, and 3.7 million hectares (25%) on the island of Papua.

In 2016 the PPKL Directorate of the Ministry of Environment and Forestry has identified the distribution of peat hydrological units in the unitary territory of the Republic of Indonesia with a scale of 1: 250,000. The distribution of peatlands is in 19 Provinces with a total area of 24,667,804 hectares. The distribution of peatlands is as follows: Sumatra Island with an area of 9,604,529 hectares, spread in 10 Provinces (Aceh, Bangka-Belitung, Bengkulu, Jambi, Riau Islands, Lampung, Riau, West Sumatra, South Sumatra and North Sumatra). Kalimantan Island covers an area of 8,404,818 hectares, spread in 5 Provinces (West Kalimantan, South Kalimantan, Central Kalimantan, East Kalimantan and North Kalimantan). Sulawesi Island covering an area of 63,290 hectares, spread over 2 Provinces (West Sulawesi and Central Sulawesi). Papua Island with an area of 6,595,167 hectares, spread over 2 Provinces (Papua and West Papua).

Data from the National Aeronautics and Space Agency (LAPAN) states that in the period July - October 2015, the area of burned land reached 2,089,911 hectares (618,574 hectares of peatland and 1,471,337 hectares of non-peat). In 2019 the peatlands burned 1,600,000 hectares. One of the reasons is the high level of clearing of oil palm which is opened by burning.

Damage to forests and peatlands also causes loss of biodiversity and natural resources therein. Even the existence of ditches and slurans in peatlands is useful for transporting wood, agricultural products and water traffic, but if not addressed by an adequate water regulating system, the impact on water flowing from the peat into the surrounding river is uncontrolled, so that the peatland in the dry season it becomes dry and flammable. In the last decade on the island of Sumatra, has caused a decrease in carbon content of ± 3.5 billion tons of carbon.

Fadli Ahmad Naufal from the Madani Sustainability Foundation mentioned five provinces that contributed the biggest forest fires namely Cen-

tral Kalimantan, West Kalimantan, Papua, South Kalimantan and South Sumatra. Most fires that occur in the province are in peat areas. More than one million ha of burned area in 2019 or around 63% are new areas that are closely related to oil palm concessions and industrial plantations. Fadli explained, 44% of fires were inside protected peatland areas. Two provinces which are areas with priority for peat restoration are South Sumatra and Central Kalimantan.

The World Bank reported that the total economic losses from forest fires in Indonesia in 2019 reached US \$ 5.2 billion or around Rp72.9 trillion. This value is equivalent to 0.5% of Indonesia's Gross Domestic Product (GDP). Quoting Reuters, the estimate is based on a study of eight provinces affected by fires in June to October 2019. World Bank analysts say that fires cause significant negative economic impacts. Reports from the World Bank estimate direct damage to assets reached US \$ 157 million, while losses from economic activities reached US \$ 5 billion. As a result, more than 900 thousand people suffered from respiratory illness, 12 national airports stopped operating, and hundreds of schools in Indonesia, Malaysia and Singapore were closed due to fires. In addition, smoke from the fires triggered diplomatic conflicts between Kuala Lumpur and Jakarta.

Peatland Ecosystem Conservation

IUCN (1968) asserts that conservation is the management of air, water, soil, minerals to living organisms including humans so that the quality of human life can be achieved. Randall (1982) emphasized that conservation is a socially optimal allocation of natural resources between times (generations).

Ian Campbell (1972) gives the meaning of conservation with three meanings, namely: first, preservation (preservation) or preservation of natural resources, second, the utilization of natural resources with the use of reason (intellectual utilization), and third, the wise use of natural resources (wise use). Conservation of living natural resources is the management of living natural resources whose use is carried out wisely to ensure the continuity of the supply while maintaining and increasing the quality of diversity and value (Suhartini, 2009).

Conservation can contribute a lot to regional development, by attracting tourists to rural areas. The development of tourism in and around conservation areas is also one of the best

ways to bring economic benefits to remote areas, by providing local employment opportunities, stimulating local markets, improving transport and communication infrastructure.

Peat ecosystem conservation or also called conservation or protection of peat ecosystem is a systematic maintenance and protection of peat ecosystem for the preservation and prevention of damage and reduction of peatlands. It has been ascertained that many conservation sectors involve related sectors. Peat ecosystems are only able to accommodate relatively few species (on average no more than 15% of local flora and fauna) but have highly specialized dominating species (Minayeva *et al.*, 2016).

Conservation is not only by individuals or organizations that are directly responsible for the management of biological resources such as agriculture, fisheries, forestry and wildlife, but it is the responsibility of the health, energy and industry sectors. This is because conservation is an aspect of management that ensures that sustainable use as well as protecting ecological processes and genetic diversity are important for the maintenance of the resources concerned with other sectors. Conservation is an aspect of management that ensures that sustainable benefits come fully from biological resources and that activities are centralized and carried out so that resources are maintained.

From an environmental perspective, conservation is an efficient way of using energy, transmission, production, or distribution which results in a reduction in energy consumption on the other hand providing the same level of services. Conservation as an effort to protect and manage carefully the environment and natural resources (physical). Conservation is the management of a certain quantity that is stable throughout the chemical reaction or physical transformation. Conservation as a way of asylum and long-term protection of the environment. Conservation as one of the beliefs that the natural habitat of an area is managed, while the genetic diversity of species can work by maintaining their natural environment.

Conservation benefits for: 1) protecting the richness of natural ecosystems and maintaining *rédigée* - ecological processes as well as sustainable ecosystem balance; 2) protect rare or endangered species of *botánica* and fauna; 3) protect beautiful and attractive ecosystems; 4) protect ecosystems from damage caused by natural factors, micro-organisms and others; 5) take care of the quality of the environment so

that it is certainly maintained, and others; 6) prevent losses caused by life support systems such as damage in protected forests, riverbanks and others. Damage to the environment will bring disaster and automatically cause loss; and 7) prevent losses due to loss of genetic resources contained in flora that create food and instructions for medicines.

Peatland ecosystem conservation is a series and stages of dynamic activities on peatlands to save and preserve ecosystems. Conceptually and praxis includes several activities: a) land clearing; b) commodity selection; c) land use patterns; d) maintain and improve quality and quantity; e) monitoring; f) management of activities through the formation of groups or organizations; and g) rules which act as references. Among the forms of governance include laws, regulations (central and regional), and rules drawn up by group / organization administrators and their members.

Law number 5 year 60 concerning Basic Regulations on Agrarian Principles emphasizes that to ensure the sustainable use of the area, it is inseparable from the concept of conservation as a form of effort to preserve soil resources and to remain sustainable and productive as a source of life. Whereas Law number 26 of 2007 concerning Spatial Planning emphasizes that the relationship to preserve land and water is very closely related to the arrangement of allotment for various interests.

Concept of Empowerment

The empowerment approach was born from a variety of development theories, including the theory of power dependency, systems theory, ecological theory, conflict theory, resource mobilization theory, and constructivism theory. To understand the empowerment approach in the context of peat ecosystems can be explored, a minimum of 3 theories as follows: system theory, social mobilization theory and constructivism theory.

First. System theory from Talcot Parsons (1991) which confirms that each society is composed of a different set of subsystems based on structure and based on functional meanings for the wider community. When people change, they will grow with better abilities, especially in overcoming life problems. There are 4 functions that must be possessed by a system to be able to survive, namely adaptation, achievement, integration, and pattern maintenance. 1) Adaptation. A system must be able to cope with external situations that are critical. The system

must be able to adjust to the environment; 2) Achievement. A system must define and achieve its main objectives; 3) Integration. A system must regulate the relationships between parts that become its components. The system must be able to manage the relationships between all other important functions; and 4) pattern maintenance. A system must complement, maintain and improve individual motivation and cultural patterns that create and sustain motivation. This social system theory confirms that the strength of the group lies in a group of administrators and members in it. The number of people who are large and able to survive even dynamically gets bigger, then the power of groups tends to have been or is being empowered.

Second. Resource mobilization theory from Jasper (2010). Jasper asserted that social movements consist of individuals who interact with each other. It is certain that interactions for the purpose of increasing the capacity of individuals and groups. In the context of community empowerment, the theory of resource mobilization is a strong foundation. The basis is increasing the capacity of the results of social interaction. To become a person or group of people who are empowered, who have power, and who have capacity; must have capacity in the form of knowledge and skills. Social mobilization theory has an important role to increase the capacity of people and community groups.

Third. Glasersfeld's Constructivist Theory (1987). Glasersfeld stressed that learning is generative. Learning as a human activity to build strength with knowledge and experience. Learning places more emphasis on process. The intended results must be achieved through a continuous process. Processes that involve ways and strategies in learning become more important than learning outcomes. In the empowerment approach, constructivism theory emphasizes the importance of educational values, local wisdom values such as togetherness, sincerity, cooperation, honesty, hard work, contributions, and active participation in the development process. All these values must be built and constructed by the community themselves to create change to be more empowered. All these values are constructed as the power of society.

Shardlow (1998) in Adi (2008) the notion of empowerment discusses how individuals, groups, or communities try to control their own lives and try to shape the future according to their desires. In his conclusion, Shardlow illustrates that empowerment

as an idea is not much different from the idea of Biestek (1961) in Notoatmodjo (2005) which is known in the field of social welfare education as "self-determination". This principle essentially encourages the client to determine for himself what he must do in relation to efforts to overcome the problems he faces so that the client has full awareness and power in shaping his future.

Jamasy (2004) argues that the main consequences and responsibilities in development programs through an empowerment approach are empowered or empowered communities. The intended strength can be seen from the physical and material aspects, economic, institutional, cooperation, intellectual strength and joint commitment in applying the principles of empowerment. The ability to empower has the same meaning as the independence of the community. One way to achieve this is to open opportunities for all components of the community in the stages of the development program. Every component of society always has the ability or potential. The integrity of this potential will be seen if between them integrate themselves and work together to be empowered and independent.

Empowerment activities through the steps above are also described by Azis (2005) in Huraerah (2008) that the stages that should be passed in empowerment are: (1) helping the community in determining the problem, (2) conducting an analysis of the problem independently (participatory), (3) determine the priority scale of the problem, (4) find a solution to the problem being faced, (5) implement concrete actions to solve the problem and (6) evaluate the entire set of activities to find out their successes and failures.

The nature of empowerment is a process and effort to obtain or provide power, strength or ability to individuals and weak communities in order to identify, analyse, determine the needs and potentials and problems faced and at the same time choose alternative solutions by optimizing resources and potentials that are independently owned.

The empowerment approach becomes a strategy as well as a new paradigm in managing peatland ecosystems in order to remain a source of livelihood and a source of shared prosperity. Fahrudin (2012) and Owin Jamasy (2004) emphasize that there are 3 tendencies for empowerment as a superior strategy namely: 1) enabling; 2) empowering; and 3) protecting. Enabling, because it can create an atmosphere

or climate that allows the potential for developing society. The starting point is the assumption that every community has potential that can be developed. Empowering, because it can increase capacity by strengthening the potential or power possessed by the community. Protecting, because it can protect the interests by developing a protection system for the community that is the subject of development.

In the empowerment approach, there are 4 principles that must be considered. (Najiati *et al.*, 2005) namely: 1) equality; 2) participation; 3) self-reliance and independence; and 4) sustainable. First, the principle of equality is an equal position between men and women. The equality process is related to developing mechanisms for sharing each other's knowledge, experience and expertise. Second, the principle of participation emphasizes that programs can be managed from planning, implementation, utilization to development. Third, the principle of self-reliance and independence is to respect and prioritize the ability of the community rather than the help of other parties. This concept does not see the poor as objects that are not capable, but rather as a subject that has little ability. Fourth, the principle of sustainability emphasizes that empowerment programs need to be designed to be sustainable, even though initially the role of the facilitator is more dominant than the community itself. But slowly and surely, the role of assistants will diminish, even eventually removed, because the community is able to manage their own activities.

Research Methodology

Data Collection and Analysis Methods

Data and information collection are an important factor in qualitative studies using descriptive methods. Data collection is done through observation, questionnaires, interviews, and focused discussion or Focus Group Discussion / FGD. (Pasolong, 2012, Singarimbun and Effendi, 1985). This descriptive method is designed to gather information about real conditions (while in progress) and examine the causes of a symptom or factor. This descriptive method combines document analysis / content analysis with trend analysis (Consuelo G. Sevilla - Jesus A. Ochave - Twila G. Punsalan - Bella P. Regala - Gabriel G. Uriarte, 2006). Data and information are processed descriptively by referring to the relevant reference rules. The results are arranged in the form of several conclusions.

Observation. This technique is used to see the situation directly regarding the discussion within the scope of survey activities. Observation is a method of observation to obtain information about human behaviour, social life, which is difficult to obtain with other methods. The principle of observation lies in reasonable and actual observation efforts without deliberate attempts to influence, regulate or manipulate. (Nasutiun, 1982).

Questionnaire/Question List/Questionnaire. This data collection technique is done by giving a set of questions or statements to other people who respondents are to answer. Although it looks easy, the technique of collecting data through a questionnaire is quite difficult to do if the respondents are quite large and spread in various regions. Some things that need to be considered in preparing the questionnaire according to Uma Sekaran (in Sugiyono, 2007) are: 1) the content and purpose of the question must be clear, as well as in the choice of answers; 2) the language used must be adapted to the ability of the respondent. Avoid using language that is full of English or other foreign language terms that the respondents are unlikely to understand; and 3) types and forms of questions whether open or closed. If open means the answer given is free, whereas if the statement is closed then the respondent is only asked to choose the answer provided.

Interview. This technique is used to obtain information about the scope of discussion in the survey activity proposal. This interview can be conducted through a Focus Group Discussion (FGD) or direct face-to-face interviews with respondents. Requirements for interviews through the FGD must be done carefully to build an atmosphere that allows participants in the discussion to express their opinions openly without fear. The effectiveness of the FGD can be determined by the quality of the questions asked (clear and concrete), the skills of the moderator or enumerator in conducting mediation in an atmosphere of discussion which is conditional with various opinions, as well as the accuracy of presenting participants in the discussion. Interviewing is an attempt to obtain clearer or more in-depth information which is commonly referred to as "probing" (Nasutiun, 1982).

Population and Sampling

Population is a generalization area consisting of objects and subjects (Hadi, 1986, and Sugiyono,

2008). Samplings are those who are representative of the population (Harbani Pasolong, 2012). They are a source of data and information that reflects the entire population (Pasolong, 2012). The population and sample in this study are beneficiaries of the Community Independence program through Peat Ecosystem Restoration from the Directorate of Peat Ecosystem Control at the Ministry of Environment and Forestry. The sampling technique in this study uses simple random sampling with the assumption that the population has homogeneous characteristics ie recipients of the same program.

They are the Management and members of the Peat Ecosystem Management and Management Work Team (TK-PPEG) which in this study is focused on 48 TK-PPEG spread across East Kalimantan Province, Aceh Province and North Sumatra Province. Other TK-PPEG are still scattered in the provinces of West Sumatra, Riau, Jambi and West Kalimantan. TK-PPEG is a social organization or Community Social Organization (CSO) formed with the principle of FROM-BY and FOR the community.

TK-PPEG is accompanied by Community Facilitators (FM) who are recruited based on special qualifications relevant to the object of the program. Assistance to TK-PPEG uses an empowerment approach. FM activities began with program socialization to the local government, formed a group called TK-PPEG, FM together TK-PPEG identified problems and social analysis, FM together TK-PPEG developed Community Work Plans (RKM) based on peat ecosystem control and management, FM together TK-PPEG realizes RKM funded by the program, and FM provides institutional assistance for TK-PPEG for existing and sustainable purposes.

There are two excellent program options from the RKM document compiled by TK-PPEG namely physical programs in the form of canal block construction, and non-physical programs in the form of demonstration plots or demonstration plots for agriculture and fisheries on peatlands as well as increasing knowledge and skills, both related to business agriculture and fisheries cultivation, as well as for the interests of building independent and sustainable TK-PPEG institutions.

Results and Discussion

The study conducted during the 2019 period confirmed that the conservation of peatland ecosystems

aims to conserve peatlands as part of the source of life and welfare of the ecosystem. Empowerment of farmers on peatlands is an effort to build strength by encouraging (motivating), motivating and raising awareness (awareness) of its potential, namely peatlands and strive to make peatlands as productive land and free from fires.

The working principle of the empowerment process for peatland ecosystem conservation is to prevent and protect. Prevent the weak condition from becoming weaker. Prevent you from falling asleep with routine fire problems and try to get up to overcome the fire problem. Protects against unequal competition or exploitation from the strong to the weak.

There is no prohibition on finding livelihoods on peatlands, but it must be realized that peatlands are prone to fire. The risk of fire will affect the environment, economy, health, and ecosystem sustainability. Fire disasters occur due to negligence or human crime and due to natural factors. Clearing agricultural land and fisheries on peatlands by deliberately burning may pose a risk of loss of fire in peatland areas. The strategic solution is by implementing programs (physical and non-physical) based on empowerment. Infrastructure development to control fires and preserve the environment must be balanced with increased participation and human resources (Owin Jamasy, 2018).

TK-PPEG who received the canal blocking program and agricultural and fishery demonstration plots, has received 5 important aspects from the planning process to the program management. Among the 5 important aspects are: 1) the formation of TK-PPEG institutions as a forum for participation, cooperation and capacity building (knowledge, skills and even behaviour); 2) knowledge about problem identification and peat-based social analysis (identifying oneself and problems and finding solutions themselves); 3) an RKM document based on peat ecosystem control and management is arranged; 4) realization of the construction of canal blocking and agricultural and fishery demonstration plots; and 5) management of canal blocking and demonstration plots for program sustainability.

TK-PPEG with canal blocking activities and agricultural demonstration plots and fisheries are more often located around peatlands. The main objective is to maintain canal blocks and manage demonstration plots or demonstration plots for crop and fish cultivation. But in the process, they are aware of the potential of peatlands as a source of livelihood. In

the process they are aware to protect peatlands from fires and even understand that clearing land by burning is not a good way and even risks ecosystem life.

TK-PPEG with assistance from community facilitators, motivated to work with other social groups such as the Fire Concerned Community (MPA), the Rapid Reaction Team (TRC), and other community groups. They become strong because there is cooperation with a partnership pattern. This collaboration is one of the bases towards program sustainability.

Exploring livelihoods and welfare through the conservation of peatland ecosystems, will be more successful and effective if all stakeholders (central government to the community or farmers) have the same commitment. Commitment to one direction / goal and one plan, commitment to the importance of participation and togetherness, commitment to the educational process, commitment to mutual trust and mutual respect for strengths and weaknesses, commitment to the potential of the community, and commitment to the rules that apply in group life namely TK-PPEG.

Barriers perceived by the community, as well as being a challenge for observers of development and the environment include: 1) limited community capacity (knowledge and skills) in conserving peatland ecosystems; 2) assistance from community facilitators requires enough time. The intensity of mentoring by the facilitator should be more than 6 months; 3) the role of the facilitator for TK-PPEG is to establish partnerships with financial institutions and the like. Therefore, the facilitator must have capacity in terms of the concept of partnership; 4) TK-PPEG sustainability is a hallmark of the empowerment process and approach. Therefore, community facilitators must have capabilities in the field of community organization institutions.

References

- Adi, I. Rukminto, 2008. *Intervensi Komunitas Pengembangan Masyarakat sebagai Upaya Pemberdayaan Masyarakat*. PT. Raja GrafindoPersada. Jakarta
- Agus, F. and Subiksa, I.G.M. 2008. *Lahan Gambut: Potensi Untuk Pertanian dan Aspek Lingkungan*. Balai Penelitian Tanah. Bogor.
- Andriesse, J.P. 1974. *Tropical Peats in South East Asia*. Departement of Agriculture Research of Royal Tropical Institute. Communication 63. Amsterdam. 63p.
- Chalid, Pheni, 2005. *Otonomi Daerah Masalah, Pemberdayaan*

- dan Konflik*. Penebar Swadaya. Cetakan pertama. Jakarta.
- Consuelo G. Sevilla, Jesus A. Ochave, Twila G. Punsalan, Bella P. Regala and Gabriel B. Uriarte, 2006. *Pengantar Metode Penelitian*. Penerbit UI Press.
- Fahrudin, Adi, 2012. *Pemberdayaan, Partisipasi dan Penguatan Kapasitas Masyarakat*. Bandung: Humaniora.
- Glasserfield, E. 1987. *A Constructivist Approach to Teaching*. In L. Steffe & J. Gale (Eds.), *Constructivism in Education*. Hillsdale, NJ, Lawrence Erlbaum. (pp. 3-16).
- Grahame Applegate, 2003. *Kebakaran Hutan di Indonesia: Dampak dan Pemecahannya*. Dalam Ida Ayu Pradnja R. and Carol J.P. Colfer (Penyunting). *Kemana Harus Melangkah? Masyarakat, Hutan, and Perumusan Kebijakan di Indonesia*. Yayasan Obor Indonesia, Jakarta.
- Hadi, Sutrisno, 1986. *Metodologi Research*. Andi Offset. Yogyakarta.
- Hetifah Sj Sumarto, 2004. *Inovasi, Partisipasi and Good Governance*, Yayasan Obor Indonesia, Jakarta.
- Hikmat, Harry, 2006. *Strategi Pemberdayaan Masyarakat*. Bandung: Humaniora.
- Huraerah, A. 2008. *Pengorganisasian and Pengembangan Masyarakat*. Penerbit Humaniora. Bandung.
- Jasper, James M. 2010. *Social Movement Theory Today: Toward a Theory of Action? Sociology Compass* 4/11 (2010): pp., 965-976, 10.1111/j.9020.2010.000329.x. New York: Graduate Center of the City University of New York.
- Masri Singarimbun and Sofian Effendi, 1982. *Metode Penelitian Survei*, LP3ES, Jakarta.
- Minayeva, T., Bragg, O. and Sirin, A. 2016. *Peatland biodiversity and its restoration*. Dalam: Bonn A., Allot, Evans M., Joosten H. and Stoneman R. *Peatland Restoration and Ecosystem Services, Policy and Practice*. Inggris (UK): Cambridge University Press.
- Najiati and Sri, 2005. *Pemberdayaan Masyarakat di Lahan Gambut*. Bogor: Wetlands International.
- Nasutiun, M.A. 1982. *Metode Research*, Jemmars.
- Notoatmodjo, S. 2005. *Konsep Perilaku Kesehatan*. In: S. Notoatmodjo (ed.) *Promosi Kesehatan, Teori and Aplikasi*. PT Rineka Cipta. Jakarta: 43-64.
- Owin Jamasy, 2004. *Keadilan, Pemberdayaan and Penanggulangan Kemiskinan*, Belantika, Jakarta.
- Owin Jamasy and Juhary Ali, 2018. *Relationship Between Job Characteristics, Job Satisfaction and Productivity in the Citarum River Restoration agencies, West Java, Republic of Indonesia*. School of Management, Asia e University, Wisma Subang Jaya no. 106 JlnSS15/4, 47500, 47500 Subang Jaya, Selangor, Malaysia. *IOSR Journal of Business and Management (IOSR-JBM)* e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 20, Issue 9. Ver. III (September. 2018), PP 10-22 www.iosrjournals.org
- Pasolong, Harbani, 2012. *Teori Administrasi Publik*. Alfabeta. Yogyakarta.
- Pearsons, Talcot, 1991. *The Social System*. Routledge is an imprint of Taylor & Francis, an informa company.
- Polak, B. 1952. Occurrence and Fertility of Tropical Peat Soils in Indonesia. *4th International Congress Soil Science* 2: 182-185, Amsterdam. The Netherlands.
- Richard Krueger, Focus Groups, 1988. *A Pratical Guide for Applied Research*, Sage Publication.
- Ritung, S., Nugroho, K., Mulyani, A. and Suryani, E. 2011. *Petunjuk Teknis Evaluasi Lahan Untuk Komoditas Pertanian (Edisi Revisi)*. Bala Besar 71 Penelitian dan Pengembangan Sumberdaya Lahan Pert.
- Rivai Veithzal, 2005. *Pengurusan Sumber Daya Manusia Untuk Perusahaan*, Jakarta: PT. Raja Grafindo Persada.
- Sadan, Elisheva, 1997. *Empowerment and Community Planning: Theory and Practice of People-Focused Social Solutions*. Tel Aviv: Hakibbutz Hameuchad Publishers in Hebrew [e-book].
- Sugiyono, 2008. *Memahami Penelitian Kualitatif*, Alfabeta. Bandung.
- Suharto, Edi. 2005. *Membangunma syarakat memberdayakan rakyat*. Bandung: Refika Aditama.
- Suhartini, 2009. *Prosiding Seminar Nasional Penelitian, Pendidikan dan penerapan MIPA [16 Mei 2009]*. Yogyakarta. [Internet]. [diakses 17 April 2014]. Can be downloaded from: <http://www.search-document.com/pdf/1/KajianKearifan-Lokal-Masyarakat-dalam-Pengelolaan-Sumberdaya-Alam-danLingkungan.html>
- Susan Dawson, Lenore Manderson, and Veronica L. Tallo. (1993). *A Manual for the Use of Focus Group Group*, INFDC, US, USA.
- Vredendregt, J. 1981. *Metode dan Teknik Penelitian Masyarakat*. Jakarta: PT. Gramedia.
- Wahyunto, S. Ritung, Suparto and Subagjo, H. 2005. *Sebaran Gambut dan Kandungan Karbon di Sumatera dan Kalimantan 2004*. Wetland International Indonesian Programme. Bogor.
- Wahyunto, S. Ritung, Suparto and Subagjo, H. 2004. *Map of Peatland Distribution and its Content in Kalimantan*. Wetland International-Indonesia Programme and Wildlife Habitat Canada. Bogor, Indonesia.
- Wahyunto, S. Ritung, Suparto and Subagjo, H. 2003. *Map of peatland distribution and its C content in Sumatera*. Wetland International-Indonesia Programme and Wildlife Habitat Canada. Bogor, Indonesia.
- Directorate General of Pollution and Environmental Damage Control (PPKL) Ministry of Environment and Forestry of the Republic of Indonesia.
- Indonesian National Aeronautics and Space Agency (LAPAN).
- Law of the Republic of Indonesia Number 26 of 2007 concerning Spatial Planning.
- Law of the Republic of Indonesia Number 5 of 1960 concerning Basic Regulations on Agrarian Principles.