

# Community Based Peat Land Management in Siak Regency The Riau Province of Indonesia

**Dr. Febri Yuliani, M.Si**  
University of Riau Indonesia

**Abstract.** This peat land restoration program in Riau Province especially Siak Regency, there is activity plan as follow: (1) Rewetting Program, The rewetting activities consist of Construction of artesian wells, Canal development, Water management development (at a company), and Water management team building and training.(2) Revegetation Program, The revegetation program is a green activity area especially on burnt-out land, among others: Making of peatland village seedlings, Cultivating of seedlings from peatland villages, Making of horticultural crops, and Cultivating of horticultural crops. (3) Social Economic Revitalization Program covers: development of land fishery business, livestock development business, honey bee development business, ecotourism development of peatland, cultivation of natural plant, utilization and processing of sago pulp, mangrove crab cultivation, sustainable development of food house, development of peat moss care village. In the case of peatland restoration program, many stakeholders are involved from variety of interests to succeed peatland restoration program. The research method used qualitative method. The purpose this research is Community Based Peat land Management in Riau Province of Indonesia. The results this research (1) Peat land restoration program is an activity to restore degraded peat soil back to its original function. The effort of peat land restoration program is still a realization from the rewetting program, which is the construction of canal blocking. Meanwhile the revegetation program, the Peat Land Restoration Agency collaborate with social institution by assisting the society has done the planting of sago seedlings like natural wood. For the revegetation program, it has not been realized due to the massive implementation for peatland restoration program, (2) Community empowerment through grant / rolling assistance need to pay attention, among others are: (1). Types of economic commodities. The selection of the right type of economic commodity will greatly affect the success of economic activity. (2). Guidance and mentoring. (3). An example of success. Support from local government is generally given to groups that have demonstrated tangible success, so that the role of counselors to communicate with local government is urgently needed; (4). Motivators in groups. there is a motivator among group members. In the group that is considered successful, there is always one member of the group who gained success first and then provide motivation to other group members to move forward, (3) Strong village institutions and good village capacity will have a major impact on the progress of village development. Villages that have large natural resource potential without accompanying a good management model will certainly not have a major impact on the progress and welfare of their communities. To increase the participation of local communities in the management of natural resources, the role of village institutions is very important. Village institutional and village capacity building can be done through training and seminar activities, which can be a capital for village natural resource management

## 1. Introduction

Peat is formed from the accumulation of crop residues, both decayed and not. The accumulation is thicker because the decomposition process is hampered by conditions of lack of oxygen and/or other environmental conditions that cause pressure on the decomposers. Therefore, peatlands are often found in backswamp areas or poorly drained basin areas. The formation of peat soil is a geogenic process, namely the formation of soil caused by the process of deposition and transportation, in contrast to the process of forming mineral soil which is generally a pedogenic process.

Several studies estimate the formation of peat in the world between 10,000-5,000 years ago (during the Holocene period) and peat in Indonesia between 6,800-4,200 years ago (Andriesse, 1994). Peatlands in Indonesia are found in lowlands and highlands. In general, peat swamp land in the lowlands is found in tidal swamp areas and ramps, located between two major rivers in the physiography / backland of the backswamp, swalle, closed basin, and coastal plain. Peat swamp land in the highlands is generally found in closed basins such as those found in Rawa Pening (Central Java), Padang Sidempuan (North Sumatra), and Danau Sentarum, Kapuas Hulu (West Kalimantan). Most peat swamp land is in the lowlands and only a small portion is found in the highlands.

Landform formations that are relatively the same or similar to the formation process and dynamics are called physiographic units. The characteristics of peat ecosystems are referred to as "peat hydrological unity" (KHG), peat ecosystem located between 2 rivers, between rivers and seas, and / or at swamps or puddles. Meanwhile, what is meant by "peat ecosystem" is the order of the peat element which is a comprehensive whole unit in peat hydrological unity that influences each other in shaping their balance, stability and productivity. Whereas what is meant by "characteristics of peat ecosystem" is the nature of peat which consists of physical, chemical, biological, and sediment types below it, which determines the carrying capacity of the peat ecosystem area as a growing medium, environmental service provider, biodiversity owner, and hydrotopography.

Indonesian peat characteristics generally have large peat domes and woody peat covering extensive swamp and forested peatlands and in low landscape areas. Located mainly among large rivers. The largest peat locations are in Sumatra, including Siak Regency.

Indonesia's tropical peat is an important ecosystem among other ecosystems (high carbon carbon ecosystem) thanks to its vital role as a reservoir of carbon and water and its carrying capacity to river and beach ecosystems.

## 2. Literature Review

To see a policy, it depends on the implementation of policy itself. Implementation concerns an action of how far a direction has been programmed that really satisfy. Finally, at the highest abstraction level of implementation as a result of some measurable changes in the big problems that become a program targets.

Mileti and Gottschlich (2001) stated that disaster loss is a result of interaction of natural physical process, social characteristic of population, and environmental condition built. The characteristic differences of these three systems result in different loss in different natural disaster. It is deeper, the research reveals about society mitigation strategy in dealing with land and forest fire disaster.

Peatlands are defined as areas where there is an over 30 cm thick layer of peat on the surface. They are wetlands where partially decomposed organic material forms peat in the absence of oxygen. Peatlands are hydrological entities within rain catchment basins and therefore drainage or extraction in one part can alter the whole peatland area (Anna Salomaa ; 2018) .

Sona Suhartana (2018) Timber harvesting at peatland should proceed with great care and cautious action, as the peat characteristics are fragile and brittle. Peat is irreversible ecosystem, thus once the peat is damaged, it will be difficult to return to its normal situation. The timber harvesting at peatland area that conducted in arbitrary ways may bring about substantial and severe damage to the vegetation and peatland themselves. For facilitating and enabling the timber harvesting activities in peatland areas, forest companies commonly build a canal for transportation. Besides for transportation, the canals are also beneficial for water management, thereby enabling the vegetation to grow well. The canal development in peatland areas may cause the lowering of soil-water surface as well as induces faster decomposition at the layers over the soil-water surface.

The paradigm in the concept of disaster management is more developing, from a technocratic approach to a disaster risk management approach. This approach is the result of interrelationship of

three components namely, hazard assessment, vulnerability analysis, and enhancement of management capacity. An approach change in the disaster management process is also done by switching the top-down system to bottom-up. The society plays an important role in reducing a disaster risk reduction in its region (Yodmani, 2001).

The forest fire is relatively large is caused by the abundance of commonly flammable objects. The type is distinguished from (1) ground fire (2) surface fire (3) crown fire and Cause of Forest and Land Fires in Indonesia are: Natural Factors and Human Factors.

### 3. Research Methodology

This research's type is qualitative with explorative method. The research activity applied two data sources that were primary data obtained directly from the field, and secondary data obtained through study of documents from various sources that was relevant in this activity. Primary data was obtained through Focus Group Discussion (FGD) in research areas, observation to perception and behavior, and interview by using questionnaires. The secondary data of this study were research reports, journals, annual reports, evaluation reports, regulatory and legislative documents, meeting note, and other relevant documents.

### 4. Result and Discussion

Based on the latest survey and calculation from Wahyunto et.al. (2005), it is estimated that the area of peatland in Indonesia is 20.6 million hectares. This area means about 50% of the total area of tropical peat land or about 10.8% of the land area of Indonesia. If seen from its distribution, peatlands are mostly found in Sumatra (around 35%), Kalimantan (around 30%), Papua (around 30%) and Sulawesi (around 3%) million hectares or around 14.9% of the land area of Sumatra Island, with a major spread along the east coast lowlands, especially in Riau Province, South Sumatra, Jambi, North Sumatra and Lampung.

From this area, land classified as peat soil, where the thickness is > 50 cm, is an area of 6,876,372 ha. Most of them (3,461 million - 48,1%) are in the form of peatland with moderate depth (depths between 101-200 cm). Very deep peat (depth > 400 cm) occupies the second largest area of 2.225 million ha. (30.9%). Although the total area of peatland on Sumatra Island did not change in 2002, when viewed from the composition of the depth has changed, which is classified as peat soil (> 0.5 meters) has decreased to 6,521,388 ha or decreased by 354,981 ha (9.5%) compared to 1990. In addition, deep-peat also reduced to 1,705 million ha (23.7%), while the peat (50-100 cm thick) expanded from 0.3777 million ha (5.2%) in the year 1990 to 1,241 million ha (17.2%) in 2002.

In Indonesia, The Peatland Restoration Agency is a non-structural institution under and responsible to the President. The goal is to realize the accelerated recovery of the area and return of hydrological functions of peat moss due to forest and land fires. The activity is conducted in specific, systematic, directed, integrated and comprehensive. It is also to coordinate and facilitate peat moss restoration in Riau Province, Jambi, South Sumatera, West Kalimantan, Central Kalimantan, South Kalimantan, and Papua. The Peatland Restoration Agency has to prepare a plan and implementation of five years peat moss ecosystem restoration with approximately 2,000,000 (two million hectares).

This peatland restoration activity is certainly involve many parties to be fully realized, together with the Local Peatland Restoration Team (LPRT) for hair restoration program in Riau Province, there is activity plan as follow:

1. Rewetting Program

The rewetting activity is a continuous discussion process. The rewetting activities consist of Construction of artesian wells, Canal development, Water management development (at a company), and Water management team building and training.

2. Revegetation Program

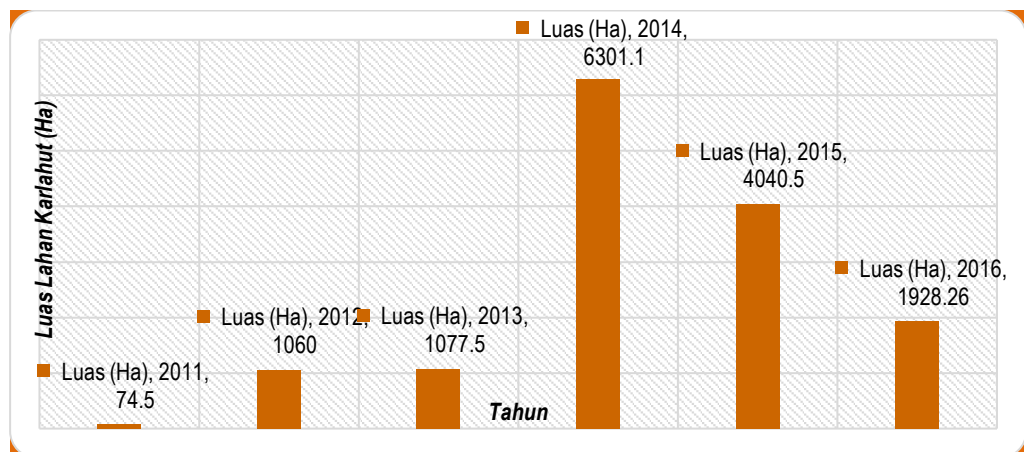
The revegetation program is a green activity area especially on burnt-out land. Revegetation programe is designed by BRG, among others: Making of peatland village seedlings, Cultivating of seedlings from peatland villages, Making of horticultural crops, and Cultivating of horticultural crops.

3. Social Economic Revitalization Program covers: development of land fishery business, livestock development business, honey bee development business, ecotourism development of peatland, cultivation of natural plant, utilization and processing of sago pulp, mangrove crab

cultivation, sustainable development of food house, development of peat moss care village. In the case of peatland restoration program, many stakeholders are involved from variety of interests to succeed peatland restoration program.

Riau Province is one of the provinces that have the largest peat land in Indonesia. Peat land area Prov. Riau reaches + 3.859.522 ha. Most of the peatlands have been utilized for various purposes such as plantations, HTI, housing and others. The water management that is not good yet so that the land becomes dry and the potential for greater karlahut is bigger worsens this.

Riau Province is one of the biggest disasters of fire forest and land province in Indonesia. The largest karlahut peak in Prov. Riau occurred in 2014, which reached 6,301.10 Ha (Sipongi-Karlahut Monitoring System, 2016). The point and area of Karlahut area in Riau Province spreaded in some regencies/cities. Among other are Siak and Pelalawan regency. Despite there is a decrease of burned land in 2016 (to an extent of 1,928.26 ha), but this case indicates that Karhut is still an environmental problem that has not been resolved completely up to now.



Data Source: Sipongi-fire land and forest monitoring, 2016

In general, the cause of land and forest fires in Riau Province can be grouped into two, namely land and forest fires is caused by natural factors and land and forest fires caused by human factors. Land and forest fires in Riau Province, especially in Siak and Pelalawan regency that continue to take place each year, the cause is mostly by human factors, either it is accidentally or intentionally.

Peatlands are one type of wetland ecosystem with potential biological resources that have the potential to be developed as life support systems (Gailbraith H, et. Al., 2005). Peatlands provide several ecological, economic and social services. Where environmental services provided are factors that must be considered in protecting the ecosystem (Egoh, B.et. Al., 2007).

The conversion of forest land to oil palm plantations on peat swamp ecosystems is the dominant factor that causes peatland degradation. Noor, M., 2007., stated that improper land management with land clearing activities that do not pay attention to the biophysical characteristics of the environment, cause peatlands to degrade and become abandoned land. This condition causes loss of genetic resource diversity, socio-cultural disintegration and marginalization of farmers and environmental damage (Reijntjes C, et.al. 1992).

Hydrological system restoration to maintain the natural process of peatland and its capacity to store carbon and other environmental services, the activities required for this component are i) physical restoration, on the hydrology of peatlands through the blocking of ditches and ditches, and ii) improvement of economic welfare of the community , accompanying these physical activities.

If the hydrological disturbance is not immediately addressed, it is feared that the level of degradation of forest and peatland areas in the region is expected to continue and worsen. These conditions will result in peatland ecosystems that will face massive environmental degradation problems in the future, including the dangers of forest and peat land fires, as well as floods, which in turn will affect the economic activities of the community, health problems and the threat of biodiversity in the forest remaining peat swamps.

The use of peatlands for plantation business in Siak Regency is expected to be able to maintain the

sustainability of ecological, economic and social functions in these ecosystems. Agroecology of oil palm plantations is a very complex and dynamic system. System dynamics are formed from various interactions between vegetation, nutrient cycles, hydrology, social and economic population (Meiling L, KJ Goh. 2008).

Oil palm plantations on peatlands have brought about significant changes and caused loss of ecological, economic and social functions on these peatlands. Opening and land clearing activities and channel construction (canalization) cause changes in the water system (hydrology). This condition affects the changes in land fertility levels, subsidence and irreversible drying, peatland fires and land conflicts.

The development of oil palm plantations on peatlands is carried out with the principle of agricultural development based on the optimization and sustainability (sustainability) of land resources, without neglecting aspects of productivity, economic and social values. According to Cooke IR et.al (2009) and Walter C, H Stutzel., 2009 states that a multidisciplinary approach using agroecological indicators that integrate ecological, social and economic aspects can be done to evaluate the sustainability of plantation activities.

## 5. Conclusion

1. Peat land restoration program is an activity to restore degraded peat soil back to its original function. The effort of peat land restoration program is still a realization from the rewetting program, which is the construction of canal blocking. Meanwhile the revegetation program, the Peat Land Restoration Agency collaborate with social institution by assisting the society has done the planting of sago seedlings like natural wood. For the revegetation program, it has not been realized due to the massive implementation for peatland restoration program.
2. Community empowerment through the activities of granting grants / revolving assistance needs to pay attention to, among others are: (1). Type of economic commodity. The selection of the right type of economic commodity will greatly affect the success of economic activities. (2). Guidance and assistance. (3). Examples of success. Support from the local government is generally given to groups that have shown tangible success, so the role of the facilitator to communicate with the local government is very necessary; (4). Motivators in groups have motivators among group members. In groups that are considered successful, there is always one group member who gets success first and then gives motivation to the other group members to move forward.
3. Strong village institutions and good village capacity will have a major impact on the progress of the village development. Villages that have large natural resource potential without being accompanied by a good management model will certainly not have a major impact on the progress and welfare of their people. To enhance the participation of local communities in the management of natural resources, the role of village institutions is very important. Strengthening village institutions and the capacity of village officials can be carried out through training and seminars, which can become capital for village natural resource management.
4. Community empowerment in the management of peatlands (beaches and transitions) is determined by land and water management arrangements; use of ameliorant / fertilization; land fires and productivity of oil palm plants. The success of sustainable agriculture development on peatlands is by regulating land and water management in accordance with the characteristics of water in the area. Water management arrangements (drainage depth) will affect the rate of subsidence on peatlands.
5. Economic empowerment of the people in the sustainability of the management of coastal peat and transitional peat (brackish peat) shows that the level of management of oil palm plantations is still low in Siak Regency. Oil palm plantation activities have an impact on the degradation of the quality of peatlands.

## 6. Recommendation

1. The restoration of peat lands continues to be implemented in accordance with its achievement targets for all priority areas throughout Indonesia and not just a pilot project and only the interests

of some people. As an implementer that has a quite important role, the Peat Moss Restoration Agency should be more have coordination particularly to local government, since the local government has the territory but also has an authority.

2. There needs to be a Village Institutional System Study that aims to identify the types of institutions that exist and explore their problems and needs, as a reference for community empowerment through village institutional development. The assessment was carried out through direct interviews and group discussions with the Village community leaders and tools. Interviews are conducted to collect various information that is needed, then collected and grouped so that it becomes more effective and focused.
3. In an effort to increase the institutional capacity of village government, the intervention of local government and social institutions becomes very important, namely: Provision of Facilities / Media for Information in Villages, Informal Meetings and involving Village Devices in Meetings and Training. Coordinating various new information and building understanding of development and problems in the village are carried out through various informal meetings to build emotional relationships and mutual openness, so that village issues and personal aspirations of village devices will be easily explored and mediated.
4. The existence of technology that can be applied in the community to maintain ecology in a sustainable manner through the arrangement of land and water management in accordance with the characteristics of water in the area, because the arrangement of water systems (depth of drainage) will affect the rate of subsidence on peatlands

## 7. References

- Anna Salomaaa, Riikka Paloniemi, Ari Ekroos, The case of conflicting Finnish peatland management – Skewed representation of nature, participation and policy instruments. *Journal of Environmental Management* 223 (2018) 694-702 journal homepage: [www.elsevier.com/locate/jenvman](http://www.elsevier.com/locate/jenvman)
- Agus Erwan and Dyah., 2012, *Implementation of Public Policy Concept and Its Application In Indonesia*, Gava Media, Yogyakarta.
- Calik, M and & Sozibilir, M (2014). *Parameters of Content Analysis. Education and Science* 39 (174), 33-38
- Carmenta, R. Zabala, A, and Phelp, J. (2015). *Indonesian Peatland fires: Perceptions of solution*. Center for Internasional Forestry Research (CIFOR), November 2015.
- Cooke, I.R ., et al., 2009. *Integrating Socio-Economic and Ecology : Taxonomy of Quantitatif Methods and a Review of their Use in Agroecology*. *J. Appleid Ecology*. 46 (2) : 269 – 277.
- Dunn, William N., 2003, *Public Policy Analysis*, Hanindita, Yogyakarta.
- Galbraith, H, P., Amerasinghe, A., Huber- Lee. 2005. *The Effects of Agricultural Irrigation on Wetland Ecosystems in Developing Countries: A Literature Review*. CA Discussion Paper 1 Colombo, Sri Lanka: Comprehensive Assessment Secretariat.
- Global Pulse. (2016). *Haze Crisis Analysis and Visualization Tool: Tracking the Impact of Indonesia's Forest and Peatland Fires* ([www.unglobalpulse.org](http://www.unglobalpulse.org) .info@ ungloalpulse.org. My 2016)
- Israr Albar. (2016). *Biomass Burning from Peatland Fire in Riau Province, Indonesia. International Workshop in Air Quality in Asia*. Hanoi, 24-26 June 2014.
- Meiling, L., Goh.K.J., 2008. *Sustainable Oil Palm Cultivation on Tropical Peatland. Trofical Peat Research Laboratory & Appleid Agricultural Resources*. Kualalumpur
- Mitsuro Osaki, Dedi Nursyamsi, Muhammad Noor, Segah, H. (2016). *Peatland in Indonesia*.
- Nawawi, Ismail., 2009, *Public Policy, Analysis of Advocacy Strategy Theory and Practice*, Surabaya, PMN.
- Nazir Foad. (2017). *Peatland Restoration In Indonesia. Cafe Crossfire Debate: Deorestation – And Sustainable Dilemma 21 March*, Brussels.
- Noor M., 2001. *Pertanian Lahan Gambut; Potensi dan Kendala*. Kanisius. Yogyakarta.
- Osaki, M and Tsuji, N. (2016, Eds). *Tropical Peatland Ecosystems*, pp. 49-58. Springer, Tokyo.
- Palvia, p, Kakhki, M.D, Ghoshal, T, Uppala, V And Welan, W. (2015). *Methodological and Topic Trend in Information Systems Research: A Meta-Analysis of IS Journals*, “Communications of

- the Association for Information Systems: Vol. 37, Article 30. Available at: <http://aisel.aisnet.org/cais/vol37/Iss1/30>*
- Riant Nugroho., 20015, *Public Policy Formulation, Implementation and Evaluation*, PT. Alex Media Komputindo, Jakarta.
- Sona Suhartana dan Yuniawati, The Effect of Timber Harvesting on Fluctuation of Peat Water Level and Subsidence of Peat-Soil Surface Journal of Wetlands Environmental Management Vol 6, No 1 (2018) 74 – 84 <http://dx.doi.org/10.20527/jwem.v6i2.178> ISSN: 2354-5844 (Print) <http://ijwem.unlam.ac.id/index.php/ijwem> ISSN: 2477-5223 (Online)
- Wahab, Solihin Abdul, 2012, *Policy Analysis From Formulation to Preparation of Public Policy Implementation Models*, Bumi Aksara, Jakarta.
- Wahyunto, s. Ritung, Suparto dan H. Subagjo. 2004. *Peta sebaran lahan gambut, luas dan kandungan karbon di Kalimantan, 2000 – 2002. Proyek Climate Change, Forests and Peatlands in Indonesia*. Wetlands International – Indonesia Programme dan Wildlife Habitat Canada. Bogor. Indonesia.
- Walter, C., H. Stutzel. 2009. *A New Method for Assessing the Sustainability of Land-Use System (I): Identifying the Relevant Issues*. J.Ecological Economics. 68 : 1275-1287

### **Regulations**

- Presidential Regulation no. 1 of 2016 on the Agency for the Restoration of Peatlands.
- Government Regulation no. 71 Year 2014 on the Protection and Management of the Peat Ecosystem.