

# Peatland water utilization innovation based on community development

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**Abstract.** Peatland topography situation leads to several impact in community's daily life. Land utilities hold several roles to community living sources such farming, plantation, and spring quality of the land. In Riau Province, peatland utilities done in several way even though leads by plantation, mostly farming and fish cultivation also take part. But in every activity that done by the community, water has enormous role in the civilization development. Peatland water has several conditions that differentiate them with the water quality at other kind of land. It has color brown and low pH that cannot be consumed by the community around the land. In other way, community needs water for sanitation and living. This paper aims to identify the community development implementation based on local resources to address the water sanitation solution at peatland in Beringin Hamlet, Lubuk Muda Village, Riau Province. This study utilized participatory observation and in-depth interviews with the local community. This study found that peat water can be used to make clean water through filtering innovations and can trigger social systems in the community to be able to meet needs and support community welfare.

## 1 Introduction

The development of human life cannot be separated from the role of available natural resources in meeting life's needs. Along with the development of human activities on earth, the activities being developed are increasingly massive, both in terms of technology, industry and services which cannot be separated from the use of available natural resources. As time goes by, just as nature influences and shapes living habits, humans also have an influence in increasing or decreasing the condition of natural resources available on earth. Climate change is triggered by global warming, which makes the earth's surface temperature hotter and has an impact on all systems on earth that are interconnected with each other. The consequences of climate change include drought, water scarcity, land fires, rising sea levels and decreasing biodiversity [1] which are felt by many countries in the world. Climate change refers to long-term changes in temperature and weather patterns [1] caused by various things, but currently dominated by the impact of human activities. Human activities which have now developed through various industries and technologies have had an impact on the available natural resources, so that climate change is occurring more rapidly and the impacts felt are becoming

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stronger. The consequences of climate change include drought, water scarcity, land fires, rising sea levels and declining biodiversity which are felt by many countries in the world [1].

Indonesia is an archipelagic country that has unique topographic variations with the largest tropical peatland area in the world, around more than 13 million hectares [2] and Riau Province is the province with the largest tropical peatland area on the island of Sumatra, covering an area of 5.09 million ha. or equivalent to 56.42% of the total peat land area on the island of Sumatra [3]. Peat is a type of wetland that is formed from piles of organic material in the form of tree remains, grass, moss and animal bodies that rot in the soil so that the use of peatlands to fulfill human needs requires a different method from mineral soils in general. In the midst of current climate change, areas dominated by peatlands have their own challenges.

Peatlands are wetland habitats that are capable of absorbing and storing large amounts of carbon so that they can prevent the release of greenhouse gas emissions into the earth's atmosphere [4] so that peatlands are damaged, especially due to forest fires and disasters. Land can cause the release of carbon stores and contribute to large greenhouse gas emissions and have an impact on increasing global warming, so preserving peat ecosystems has an important role in preventing further impacts of climate change.

Climate change triggered by global warming has an impact on various other derivative problems such as drought, increasing sea levels and sea water intrusion, which then has an impact on increasing the earth's surface temperature and sea surface temperature, and the melting of ice caps or glaciers. on earth [5]. In the midst of these conditions, areas dominated by peatlands have their own challenges in responding to the various impacts of climate change. Along with the El Nino phenomenon that hit Indonesia, causing areas to become drier and water evaporation occurs more quickly, especially in peat areas and peat rivers. On the other hand, the characteristics of peat soil are that they cannot hold water in the soil so that evaporation that occurs in river areas will result in its drainage. water from peat soil into river areas and causing land peat water levels to decrease to the point of drought.

Community development is one of the forces for forming social capital in developing local potential and resolving social problems that exist in an area. The basic concept of community development is human needs, community, participation and development to achieve justice and equitable development [6]. Community development practice has also become a trend as one of the media for community development in areas around the company's operations through the Corporate Social Responsibility program which is strengthened by the enactment of regulation No. 40 of 2007 concerning Limited Liability Companies concerning "Companies that carry out business activities in fields and/or related to natural resources to carry out Social and Environmental Responsibilities". Then the government issued Government Regulation Number 47 of 2012 dated April 4 2012 concerning Social and Environmental Responsibility of Limited Liability Companies as its implementing regulation, then the United Nations Environment Program (UNEP) in 2008 launched the Green Economy movement to implement the concept of real sustainable development [7].

Disaster mitigation practices are often linked to community empowerment activities to create independent social capital in accordance with the Community Base Disaster Management concept. The role of the government and the private sector would not have been realised without the active role of the community [8]. Community Based Disaster Management an approach that encourages grassroots communities to manage local disaster risks. These efforts require a series of efforts in carrying out their own interpretation of the disaster threats and risks they face, prioritizing handling/reducing the disaster risks they face, reducing and monitoring and evaluating their own performance in disaster reduction efforts. However, the essence of both is implementation that optimally mobilizes the resources owned and controlled and is an internal part of the daily life of the community [9].

Community based disaster helps communities organize themselves to independently face disasters. Community-based disasters can help minimize disaster victims, losses caused by disasters, and dependence on aid. The importance of creating community-based disasters certainly needs to be supported by creating space that can facilitate social workers as one of the parties involved in primary and secondary settings of community-based disaster management. This can take the form of assisting and planning community-based disasters with the community or connecting the community as a base with stakeholders [10]. Community Based Disaster Risk Management (CBDRM) is an approach of promoting the involvement of grassroots-community disaster risk management at the local level. For this, a series of efforts are required that include community self-interpretation of hazards and disaster risk, reduction and monitoring and evaluation of their own performance in disaster risk reduction. However, the key to both is optimal mobilization of resources that the community has and has controlled over and become the integral part of community daily lives [11].

The Meteorology, Climatology and Geophysics Agency (BMKG) states that climate change is disrupting the hydrological cycle and making the water crisis increasingly a serious threat to all countries, both developed and developing countries. On the other hand, the massive conversion of land into plantations has resulted in land cover in Riau province deteriorating. Water quality is influenced by the vegetation in the water flow area and the large number of industrial and plantation activities. Beringin Hamlet is a hamlet located in Lubuk Muda Village, Siak Kecil District, Bengkalis Regency, Riau Province. This area is in the Siak Kecil River Basin with the Dayang River as a tributary which is often used by the community for transportation, food and water needs.

The people of Beringin Hamlet have been using peat water from the Dayang River which is brown, sour and smelly to meet their daily needs, especially for washing clothes and bathing because this area also does not have PDAM access, but the quality of the river water is apparently not suitable for consumption and This causes clothes that are washed using water to become damaged more quickly and change color, especially white clothes that become dull. This is also caused by the topographic conditions of the area which are dominated by peatlands and the impact of climate change which has worsened water quality, plus more than 61% of the land cover in the Beringin Hamlet area has been converted into plantations and only 0.8% of the original forest area remains. this is increasingly critical (PSPL UNILAK, 2023). The following are the results of laboratory tests on the quality of peat river water consumed by people on a daily basis does not comply with the water quality standards according to Regulation of Health Ministry of Indonesia No 02 Tahun 2023. Many factors can cause the quality of peat water to worsen, such as the forest and land fires disaster, unproductive (bare) land, and massive land clearing. In order to resolve this phenomena, PT KPI RU II Sungai Pakning initiated the Sungai Gambut Berseri Social Innovation through Community Development Program to provide the community's need for clean water while protecting the riverbank environment in Beringin Hamlet to maintain water quality.

The empowerment program which is entering its third year, has provided various assistance to community groups including infrastructure assistance, capacity development, and assistance in the form of goods to support business activities. The sustainability of community empowerment programs is very dependent on the efforts of beneficiary groups to be able to manage the resources and capacities they have to provide benefits for themselves thereby reducing dependence on aid providers. The group's ability to manage resources and carry out group activities independently without assistance and support is one of the factors in the success of community empowerment programs [12]. Inclusive development requires structures that allow for the active participation of low income communities, who in turn need to adapt to new roles and contribute to development in ways that may be at odds with the reality of exclusionary power structures [13].

The research carried out aims to examine the community's response and efforts in seeking the sustainability of the empowerment program which has been running for three years. The implementation of empowerment programs often fails because the beneficiaries cannot manage the resources provided well, the community often thinks that the assistance provided will always be there so they do not prepare a plan if one day the assistance is stopped. It is important to pay attention to the community's response during the program as a benchmark for changes in community attitudes during the implementation of the program. This research tries to reveal how the program succeeded in triggering changes in attitudes within the community so that it was able to increase independence by efforts to fulfill needs initiated by the community itself people who hold stakeholder theory believe that the survival and development of modern enterprises are not completely due to the capital investment of shareholders or the risk of enterprises' operations all borne by the shareholders.

## **2 Method**

This research uses a qualitative approach, where qualitative research aims to explain phenomena in as much depth as possible through in-depth data collection. This research does not prioritize population size or sampling, in fact the population or sampling is limited [14]. According to Bogdan and Taylor [14] a qualitative approach is expected to be able to produce an in-depth description of speech, writing and behavior that can be observed from a particular individual, group, society, organization in a particular setting context which is studied from the perspective of a complete, comprehensive and holistic view.

Qualitative research aims to gain a general understanding of social reality and participant perspectives. Researchers use data collection techniques in the form of observation and document study, which is a process of collecting data such as documents, papers, office reports and private documents such as diaries, letters and emails [15].

Researchers used documents such as books, photos, company reports and media reports related to the implementation of the Sungai Gambut Berseri CSR program. The action research method is also used in creating documents carried out by companies while providing assistance and monitoring programs with the community. Problems and obstacles that arise during program implementation also become material for researchers to obtain data to improve future programs. The company also holds discussion forums with community groups to analyze conditions for program improvement and predict community conditions and behavior in the future. As an implementer of empowerment programs, the company always prioritizes active community participation in program formulation and innovation.

## **3 Result and discussion**

Community development is a social activity seeking to improve the quality of life of people by empowering them to emphasize the principle of social participation [16]. Efforts from the private sector are also important in development and are often called Corporate Social Responsibility (CSR) and are widely known as corporate social responsibility (CSR). CSR is often understood as the company's responsibility in doing business profitably while still prioritising environmental and social sustainability efforts [17]. The implementation of the Berseri Gambut River Program involves the Beringin Hamlet community, which is a community that lives around the river basin, to be able to utilize river water as a source of water needs. Communities are actively engaged in the identification, assessment, treatment and planning for hazards and vulnerabilities of various kinds [18].

Corporate social innovation is a concept that has developed to answer problems that limit the movement of corporate social responsibility carried out traditionally. Corporate Social

Innovation as a strategy that combines a unique set of corporate assets (innovation capacity, marketing skills, managerial acumen, employee engagement, scale) in collaboration with other sector and corporate assets to co-create breakthrough solutions for complex economic, social and environmental which impacts the sustainability of business and society [19]. The trend in implementing social innovation is also increasing from year to year [20]. Apart from building water filtration facilities, the company also provides training for the people of Beringin Hamlet to be able to manage both operational and maintenance equipment. Workers at PT Kilang Pertamina Internasional RU II Pakning River Production taught their competence in water processing directly to the community. The brown and murky peat river water is currently processed by the community using peat water filtration facilities (Filagam) to produce clean water that is ready to be used in accordance with water quality standards for MCK activities. Apart from filling water needs in public facilities used by the community, filagam treated water is also distributed to the people of Beringin Hamlet through pipes installed along the hamlet road in front of the people's houses.



**Fig. 1.** Peat Water after being processed.

The existence of clean water provided by the community makes them start to think about developing activities that can be carried out by utilizing water resources. One of these activities is water treatment with a Reverse Osmosis (RO) facility which produces water suitable for consumption in accordance with the standards of the Minister of Health's regulations. Currently the Tirta Muda Group, which has developed into a cooperative, sells ready-to-drink water in either gallon or bottle packaging. With these facilities, the community is now able to meet the community's water needs not only for toilets but also for drinking and consumption water needs so that they do not only rely on rainwater. Through the Berseri Gambut River Program, which provides water resources for the community, it has a good impact not only on the economic aspect, but also on the social and environmental aspects of the Beringin Hamlet community.

### 3.1 Public awareness of program sustainability

Peat water is water that is cloudy because of dissolved impurities and is brown or yellow in color. The peat water in Lubuk Muda Village, which also flows through the Dayang River, which is a tributary of the Siak River, also has the same conditions as peat water in general. Processing peat water into clean water is done by binding the peat water impurities with a coagulant which is then filtered so that the precipitated impurities are filtered out. Previously, water treatment using a filtration process was carried out using precipitating materials (coagulants) obtained from chemicals such as Alum, Betz and Soda. This material is a chemical that cannot be produced by the group itself so it still depends on the company that provides the material. The price of these materials is also quite expensive considering that this water filtration device is managed directly by community groups, therefore people need materials that are cheaper, easier to obtain and affordable.

The Tirta Muda group that manages peat water filtration has begun to innovate in processing peat water using moringa seeds as a substitute for chemical coagulants to reduce production costs. The Moringa tree (*Moringa oleifera*) is a plant that can live in peatlands and can be used to make various products, including a water filtration coagulant. The group processed Moringa seeds by drying and pounding them into powder which then became an ingredient for processing peat water into clean water. The use of Moringa seeds as a bio-coagulant aims to make the coagulant material easier to obtain and cheaper because it is planted directly by groups in the Beringin Hamlet area. Planting Moringa plants is also in line with agroforestry practices which are a support activity in Beringin Hamlet, this activity is intended to support for the availability of bio-coagulant materials and environmental sustainability of river areas. Apart from planting Moringa trees, vegetable and fruit farming using yards is also carried out by the hamlet community to support food security.

Moringa planting activities and the transfer of chemicals to biocoagulant materials show that the community has a fairly good vision and has an understanding of the sustainability of the program. This awareness indicates the company's success in being able to provide education so as to open people's insight regarding the sustainability of the program.

### 3.2 Public awareness of environmental responsibility

River water was previously used by the community for sanitation or toilet activities without going through a processing process so it did not meet the standards for water that can be used for sanitation. With the existence of the Filagam facility, the community can now utilize river water which is processed into clean water and can not only be used for toilets but can also meet water needs for consumption. Through this activity, the community has become aware that they must maintain the sustainability of the river ecosystem because they consider river water to be one of their sources of life. This public awareness has given rise to community activities to manage rivers so that they remain sustainable, namely through river conservation activities.

Stakeholders are parties from internal or external organizations who have an interest and influence on the performance of the organization concerned. Stakeholders can be organizations, communities, socio economic groups, governments, or institutions that come from various dimensions at every level of society [21]. People who are not only from the Tirta Muda Cooperative are also aware of the importance of maintaining the sustainability of the river ecosystem so that the awareness that arises does not only come from one group. By forming a conservation group, the community began to nurse plants typical of the river basin so that they could be replanted. The cooperative also built a nursery facility which is used to seed typical peat river plants which will later be planted around river areas that need to be

replanted. Plant marking is also carried out in pristine river basin areas so that these locations can be used as educational locations and providers of plant seeds typical of river areas.

## 4 Conclusion

The existence of the Sungai Gambut Berseri Program which empowers communities to maximize their potential has succeeded in encouraging communities to change and have a sustainable outlook. Generally, community empowerment programs require quite a long time to be successful in changing the community's view of sustainable programs. However, through the Sungai Gambut Berseri Program, Tirta Muda Cooperative benefit recipients have shown progress in the 3rd year of program implementation. Changing the mindset or behavior of the community to become aware of managing the potential they have to meet common needs is one of the main goals of the empowerment program. Through this program it can also be concluded that empowerment programs do not need to raise problems to be able to mobilize society, but can also encourage people to manage the potential they have. Through water processing, people begin to realize the importance of managing the potential around them and also how to maintain its sustainability.

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