International Journal of Sustainable Development and Planning
Vol. 17, No. 7, November, 2022, pp. 2123-2130
Journal homepage: http://iieta.org/journals/ijsdp

Government Collaboration in Peat Ecosystem Governance in Meranti Islands Regency, Riau Province-Indonesia

Ali Yusri*, Tito Handoko, Mohammad Yohamzy Tiyas Tinov

Department of Government Science, Universitas Riau, Pekanbaru 28291, Riau, Indonesia

Corresponding Author Email: aliyusri@lecturer.unri.ac.id

https://doi.org/10.18280/ijsdp.170712

Received: 7 April 2022
Accepted: 5 September 2022

Keywords:
government collaboration, peat ecosystem, governance

ABSTRACT

This study intends to find out how the government collaborates in managing peat ecosystems in the Meranti Islands Regency. This study uses a qualitative methodology and data analysis approach using Nvivo 12 Plus software. The findings of this study indicate that collaboration between the government and stakeholders has resulted in progress on peat restoration in the Meranti Islands Regency because the number of forests and land fires in the Meranti Islands Regency tends to decrease due to this collaboration. Nevertheless, there are still some obstacles to the cooperation, especially the cooperation between actors which is still inadequate because it has not fully involved the private sector. This research contributes in the form of recommendations for improving peat ecosystem governance by increasing the participation of private entities. This study also proposes that further research can comprehensively map the involvement of each stakeholder in the management of peat ecosystems in the Meranti Islands Regency.

1. INTRODUCTION

Peatland habitats are often wetland ecosystems with partially degraded plant species, hydrophytic plant species, and saturated conditions [1-3]. Peat differs from mineral soils in a variety of ways, including vegetation, their use, and the consequences if they are destroyed [4, 5]. Then, peatlands include dense accumulations of decaying organic materials resulting from plant waste and plant decomposition [2, 6]. Peatlands store 30 percent of the world's carbon and have strong soil, allowing them to act as a hydrological buffer for the surrounding area [7, 8]. Indonesia's drained peatlands generate the most carbon dioxide, amounting to 8% of global fossil fuel emissions [9, 10].

Based on data from Global Wetlands, Indonesia is the second largest peatland in the world with an area of 22.5 million hectares (ha) after Brazil [11]. Then, based on each province in Indonesia, Papua Province is the area with the largest peatland area of 6.3 million hectares (ha), followed by Central Kalimantan 2.7 million hectares (ha), and Riau Province 2.2 million hectares (ha). Other provinces with extensive peatlands include West Kalimantan (1.8 million ha), South Sumatra (1.7 million ha), West Papua (1.3 million ha), East Kalimantan (0.9 million ha), North Kalimantan (0.9 million ha), North Sumatra (0.6 million ha), and South Kalimantan (0.6 million ha) [3, 12]. Fundamentally, peat plays an important role in hydrology to control flooding during the rainy season and release water reserves during the long dry season. This makes Indonesia one of the countries that are rich in peat ecosystems and with all the consequences if peatlands are not managed properly [13-15].

Peatland degradation is a critical global issue [16]. In Indonesia, forest and land fires have reached 89,563 ha from 328,724 ha at the end of August 2019, most of which is peatland forest. Then, in the context of Riau Province, Meranti Islands Regency is the largest peatland area in Riau Province with a land area of ± 318,234 ha from ± 370,800 ha [5]. This shows that 75% of the land area in the Meranti Islands Regency is a peatland. Based on the existing sub-districts, Tebing Tinggi Timur District (72,628,000 ha) and Merbau Subdistrict (59,146,000) are the highest peatland areas with a depth of 4-12 meters. Where the area used is 1,562,436 for plantations, 780,333 ha for agriculture, 341,122 ha for rice fields, and 64,752 ha for settlements [3, 17, 18].

Then, in 2019, the number of peatlands burned in Riau Province reached 100 hectares with two hundred twenty-one (221) hotspots spread across Meranti Islands Regency, Pelalawan Regency, Siak Regency, and Indragiri Hulu Regency [4, 18, 19]. Then, from 1999 to 2013, the hotspots for forest and peatland fires in Riau Province have always been ranked first in Indonesia [19, 20]. Furthermore, fundamentally, the peatland fires that occurred in Riau Province in the process were caused by the existence of land clearing by corporations for plantations such as oil palm plantations and caused by a lack of supervision from local and central governments on peatland management which often made this more complex [20, 21].

The issuance of Government Regulation Number 71 of 2014 concerning the Protection and Management of Peat Ecosystems which has since been changed to Government Regulation Number 57 of 2016 concerning Protection and Management of Peat Ecosystems has demonstrated the government's commitment to the management of peat ecosystems in Indonesia. Because of this, efforts to maintain and manage peat ecosystems have entered a new phase [22, 23]. However, the issue of permits to use peatlands for the paper industry and oil palm plantations in the past contributed to the loss of the peatland ecosystem. Changes in the peatland

ecosystem are influenced by human activities such as illegal logging, land clearing by burning, and land conversion on peatlands [24-26]. The absence of control, management, and mitigation of peatland fires in the Meranti Islands Regency then require immediate attention from each stakeholder. Where to address the sustainability of peatlands, district, provincial and central governments must collaborate to combat peatland fires. This partnership will affect the number of resources needed to manage peatlands in the Meranti Islands Regency, Riau Province [3, 5, 25, 26].

The results of previous studies have shown that the conservation of the remaining peatlands in Sungai Tohor village as well as the sustainable management and restoration of peatlands in the Meranti Islands Regency requires an integrated cross-sectoral approach that requires transparent dialogue between stakeholders to negotiate complex trade-offs in environmental interests, social, and economic [3, 5, 22, 27]. Therefore, this study will investigate the collaboration between implementing actors (central government, local government, corporation, stakeholders, and communities) in implementing the peatland governance law in Meranti Islands Regency, Riau Province. Thus, the focus of this study is collaboration in peat ecosystem management with the participation of various stakeholders in the Meranti Islands Regency.

2. LITERATURE REVIEW

Conceptually, collaborative governance is designed to address policy concerns requiring public-private partnership [28, 29]. In addition, although the majority of collaborative governance is voluntary, its efficiency depends on the development of shared problem and solution expertise as well as mutual respect and trust among participating organizations [29]. In addition, collaborative governance is a network structure of multi-sectoral (government, business, and civil society) entities that attain consensus through formal and informal interactions in defining and developing norms for mutually beneficial interactions in achieving common goals [30, 31]. According to Emerson [32], collaborative action is fundamentally a cyclical process characterized by interactions characterized by the development of good communication, mutual understanding, movement of general principles (principle engagement), mutual encouragement, and the capacity for joint action. Therefore, understanding the concept of collaborative governance can help policymakers recognize the importance of policy dialogue [33-35].

In general, collaborative governance consists of five components which include: initial conditions, collaborative process, institutional design, facilitative leadership, and outcomes [36-38]. *First,* the initial conditions will investigate how collaboration develops, beginning with the history of cooperation, the imbalance of power and resources, and what barriers and incentives can foster cooperation in the early stages. In this variable, the initial motivation for engagement in the developed partnership is recorded for each stakeholder. Different contexts will determine if diverse resources and strengths will impede collaboration. This can be demonstrated by partners' shared confidence in their ability to carry out their tasks and obligations, as well as the availability of shared resources. Ultimately, the stakeholders are dependent on one another due to their confidence in the developed cooperation. *Second,* the collaboration process is more cyclical than linear. In this variable, face-to-face interaction is determined by goodwill negotiation. Collaboration is not only about negotiating, but also about how the constructed communication may increase trust, long-term commitment to the process, and a shared understanding of what perceptions will be attained, what issues will be tackled and what will be accomplished, and what values will be upheld. held basics. *Thirdly,* the Institutional Design would be founded on the fundamental laws of collaboration, in which the division of roles and responsibilities and the built process must be conducted inclusively. *Fourthly,* Facilitative Leadership will emphasize how guiding leadership replaces command leadership. This is due to the significance of the facilitator's role in synthesizing the perspectives of diverse stakeholders to accomplish shared objectives. *Fifth,* the outcomes component will demonstrate the degree of control over the achievement of the established partnership. A shared objective binds the interdependent relationship formed by the aforementioned components. So that shared resources with partners are based on the accomplishment of shared objectives [32, 36-39].

Furthermore, various literatures have shown that government collaboration in peat ecosystem governance in Indonesia still has several governance problems such as data uncertainty, lack of significant cross-stakeholder coordination, and peat restoration planning that is not in accordance with actual implementation [40-42]. Therefore, in the implementation and management of peatland restoration, it is necessary to create a joint strategy that is effective, equitable and sustainable. In this case, the same authority in deciding policies and steps to achieve peat restoration in the present and the future must be established to accommodate and optimally utilize the various potentials of various stakeholders [40, 41]. In addition, the peat ecosystem damage control policy that applies to companies that already have a permit can be applied on community land if the community has the competence to fulfill all the provisions of the policy, including monitoring and reporting [42]. Fundamentally, peatland ecosystems are very important because peatlands are highly flammable [2, 6, 7, 43, 44]. Since 2016, the Indonesian government has strengthened the institutional component of peatland protection and improved its national law [23, 44]. According to Safitri, [23], six main factors have contributed to the improvement of peatland law: strong leadership, improved coordination at the national and local levels, formulation of operational directives, the establishment of government agencies specializing in peatland restoration, law enforcement, and civil society capacity to carry out public scrutiny. Thus, it can be seen that collaborative governance will be able to make a significant contribution to the sustainability of the Peat Ecosystem [45].

3. RESEARCH METHODS

This study uses qualitative techniques as contextual studies to systematically analyze certain phenomena [46, 47]. The data in this study came from primary and secondary data. The primary data in question is a document obtained from the Regional Disaster Management Agency of the Meranti Islands Regency. As for secondary data, namely data obtained from books, proceedings, journals, and government websites. Then, the data collection technique in this study uses documentation techniques that focus on collecting data related to government collaboration in peatland management.

Furthermore, the data analysis technique in this study used the Nvivo 12 Plus application with concept map analysis features [48, 49]. This analysis will be carried out in two stages: First, analyze the data through the concept map analysis feature to explain and visualize government collaboration in peat ecosystem governance at the research site. The second step is to conclude and interpret the data that has been analyzed systematically. Therefore, this study will examine government collaboration in peat ecosystem governance in Meranti Islands Regency, Riau Province, Indonesia.

4. RESULTS AND DISCUSSION

The issue of peatland management in Indonesia cannot be separated from the practical annual peatland fires that occurred from 2013 to 2019 [26]. Peatlands have domes that hold water as deep as 14 meters below the surface, so peatland fires are considered difficult to control [3, 5, 21]. In general, the causes of forest and land fires in Riau Province and especially in Meranti Islands Regency can be categorized into two factors, namely natural factors and human factors. Natural factors include the climate and high temperatures caused by global warming which starts to burn dry twigs or leaves which then expand due to the wind and lack of rainfall, so it is very risky to burn land and forests. In addition, massive peatland fires in Meranti Islands Regency, Riau Province are also caused by human activities such as illegal logging and land burning to make plantations, as well as not optimal supervision from the government. The local government has given authority to the company which then changes the land use and clears the land for large-scale plantations. As a result, the area of peatland burned in Meranti Islands Regency reached 310.25 Ha in 2017, as shown in Table 1 below:

Table 1. List of areas experiencing peatland fires in the Meranti Islands Regency

Number	Sub-district and Village	Area of land burned (hectares/ha)
1	Rangsang, Tanjung Medang	40
2	Pulau Merbau, Semukut	70
3	Merbau, Mekar Sari	150
4	Tebing Tinggi, Alahan	0.25
5	Rangsang, Kayu Ara	50
	Total	310.25

Source: Meranti Islands Regency Regional Disaster Management Agency, 2017 [50]

Table 1 above explains that peatland fires often occur in most areas of the Meranti Islands Regency. In the Meranti Islands Regency, 2,000 peatlands are drained by making canals without partitions. The canals built by the company drain peat water, so if the canals are not blocked, the peat water will flow through the canals and into the sea, this then causes the peatlands to degrade and become very dry. Peatland fires are difficult to extinguish and produce carbon emissions. This carbon dioxide gas is produced in large quantities and quickly enough to produce a thick smoke that affects several aspects including public health and ecology which has an impact on the survival of flora, fauna, and peatland ecosystems. As a result of these problems, peatland fires must be addressed immediately, because the government, which has full responsibility for implementing the peatland management strategy, must consider the impact of losses incurred if there is no significant follow-up effort [51].

In the context of the Meranti Islands Regency, peatland management must be carried out collaboratively which requires cooperation between the government, corporations, stakeholders, and local communities. In this study, researchers used the theory of Collaborative Governance by Emerson et al. [32]. As shown in Figure 1, this study uses the components of a collaborative process, namely collaboration dynamics, collaborative action, temporary effects, and temporary adaptation of the collaboration process.

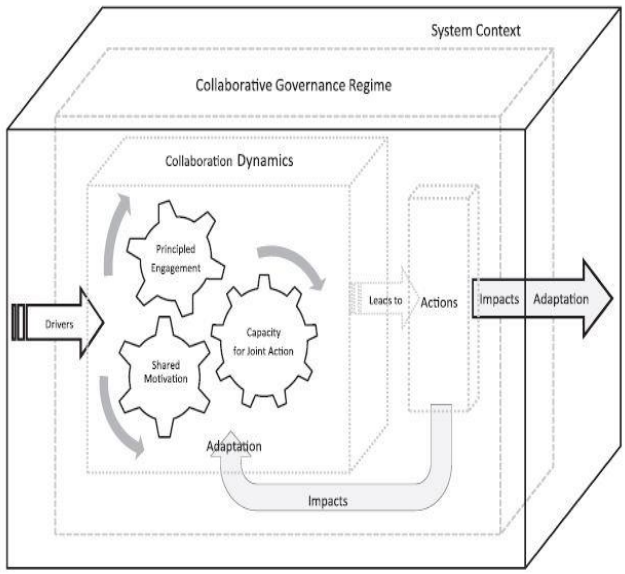

Figure 1. Collaborative governance
Source: Emerson et al. [32]

4.1 Collaboration dynamics in peat ecosystem governance in Meranti Islands Regency

Emerson et al. [32] described the collaborative process dynamics as an orientation cycle. Collaboration dynamics concentrates on its three interactional components. These elements include engagement principles, shared motivation, and the capacity for collective action. The following is a visualization of the dynamic interaction components of collaboration in peat ecosystem governance in the Meranti Islands Regency as illustrated in Figure 2.

Based on Figure 2, it can be seen that there are 3 (three) dimensions of collaboration dynamics in peat ecosystem governance in Meranti Islands Regency. *First*, the Principle of Engagement: This component explains how the affirmation of common goals, the formation, and the development of common principles are expressed in the different perspectives of the actors involved, and the unification of principles is the essence of this. The first critical step is how the government selects the actors to be involved in the cooperation. In terms of peatland management in the Meranti Islands Regency, the government has carried out mainly from 2016 to 2019, the Peatland Restoration Agency has the authority to implement a peatland restoration program and make the Meranti Islands Regency one of the most prioritized districts. In implementing the peat restoration program, the government collaborates with local governments and various NGOs that play an active role in conserving peatlands in Riau Province, namely the Indonesian Forum for the Environment (WALHI) and the Riau Forest Rescue Network (JIKALAHARI). *Second,* Shared

Motivation: emphasizes the interpersonal and relational elements of the dynamics of collaboration, which is referred to as social capital. In this case, the local government together with local stakeholders continues to develop sago cultivation because this type of plant is very suitable to be cultivated on peatlands which have been carried out by people in Meranti Islands Regency. *Third,* Capacity for Joint Action: This definition of capacity results from cross-functional elements to produce effective actions due to adequate actor capacity. In this case, the collaboration between actors is still incomplete because it has not involved actors in the private sector comprehensively. In addition, there is still a lack of commitment from the Regional Peat Restoration Team (TRGD) with the Regional Government regarding their efforts to support the peat restoration agenda sustainably in the Meranti Islands Regency.

4.2 Collaborative action in peat ecosystem governance in Meranti Islands District

Collaborative action is at the core of the shared governance framework [39]. Collaborative action is the primary outcome of linear collaboration that impacts projects and outcomes [32]. Thus, some collaborative actions have a clear objective, namely to determine strategic steps in policy issues/areas [37]. In the context of collaborative actions from actors involved in implementing the peat restoration agenda in Meranti Islands Regency, various actors are indeed indirectly connected to be partners with the Peat Restoration Agency (BRG) in the agenda because they have the same vision, namely saving the environment through peat restoration, but in reality, before the Peat Restoration Agency (BRG) existed, other actors, especially Non-Governmental Organizations (NGOs) had already done it in their respective regions and not with funding from the Peat Restoration Agency (BRG) or the government. The presence of the Peat Restoration Agency (BRG) is certainly very positive and very welcome by environmental activists who are indeed focused on saving peat. However, the lack of involvement by the private sector in the implementation of peat restoration in the Meranti Islands Regency certainly makes this collaborative action incomplete. Therefore, it becomes very important to increase collaborative actions involving each actor to overcome the problems that occur comprehensively and systematically.

4.3 The Impacts and adaptation of collaboration dynamics

In this theory, the impact in question is an impact that occurs temporarily and has expected and unexpected characteristics. In the process of government cooperation for peatland management, the expected impact is a balanced collaboration between actors so that peatlands in the Meranti Islands Regency run well. The unexpected impact is the limited implementation of the collaboration process, where the obstacles faced are related to the lack of communication between actors, perception gaps, and unaccommodated interests that implement peatland management overlap. Then, these unexpected impacts occur directly or indirectly during the collaboration process. Some of these impacts can generate feedback, which will be tailored to the collaboration. Good adaptation is when all collaborating actors can do more for the benefit of the organization [32, 39].

Then, in the process, the problem of handling peatland fires that occurred in the Meranti Islands Regency has been pursued by the government, where the central government has carried out a consistent restoration program through the Peat Restoration Agency (BRG) which also works closely with the provincial government, especially the environment and sanitation department (DLHK) and the local peat restoration team. The Meranti Islands district government and non-governmental organizations (NGOs) also contributed to creating various innovations in peat management. In addition to canal and reservoir barriers that were built as a wetting process, currently, there is a technology called SIPALAGA (Peatland Water Monitoring System). This technology is a collaboration between the Peatland Restoration Agency (BRG) and the Agency for the Assessment and Application of Technology (BPPT). 52 (fifty-two) water level gauges have been installed at several points in Riau Province since 2018. This water level monitoring device is directly connected to the SIPALAGA system, making it easier to determine fire-prone areas. Measurements can be carried out in real terms and can be an early warning for peatland fires. Figure 2 shows the results of SIPALAGA monitoring in 6 provinces in Indonesia from 1-25 May 2020.

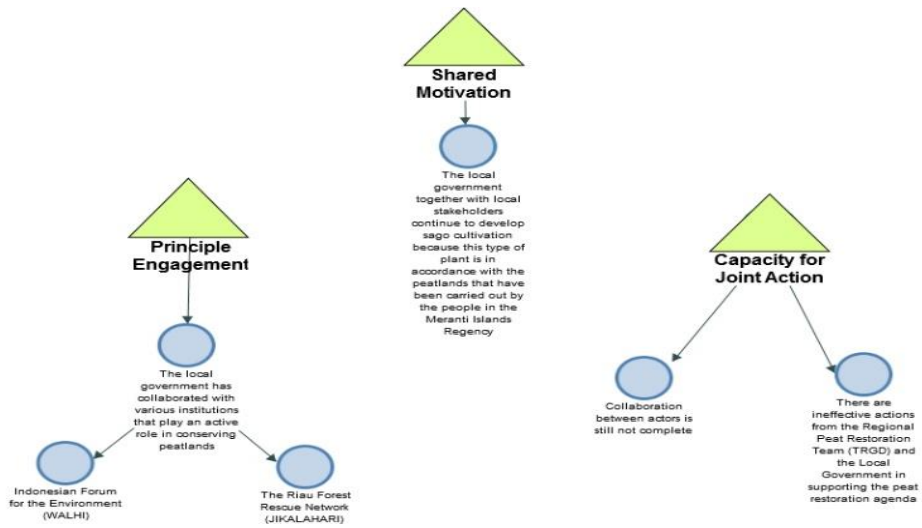

Figure 2. Visualization of collaborative dynamics in peat ecosystem governance in Meranti Islands District
Source: Analysis results using Nvivo 12 Plus, 2022

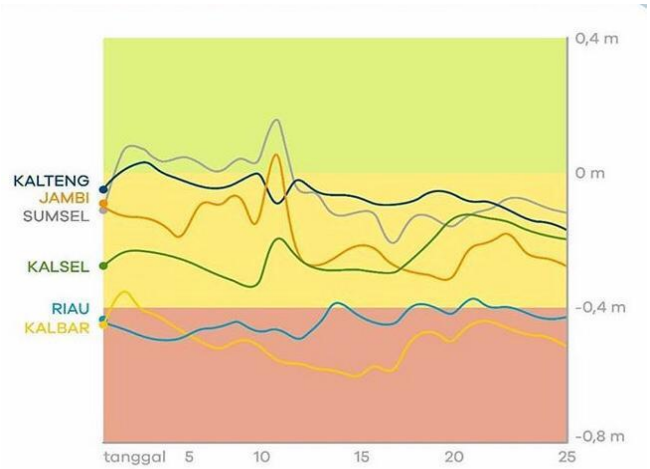

Figure 3. Graph of water level in 6 provinces in Indonesia
Source: Mitra.gambut.id, 2020 [52]

Figure 3 above shows that each axis at the point of equipment installed in Jambi, South Sumatra (Sumsel), Central Kalimantan (Kalteng) is at 0-40 cm below ground level. Meanwhile, the water level in the provinces of Riau and West Kalimantan (West Kalimantan) is 40-80 cm below ground level. The data also shows a significant increase compared to the last data in 2019 with six provinces being a high priority, with water levels of only 30-80 cm as a dangerous category. Monitoring is carried out as a preventive measure against potential peatland fires every month. Meranti Islands Regency is one of the priority districts for peat restoration, being the first district to be handled by the Peat Restoration Agency (BRG). Meranti Islands Regency has not been free from peatland fires until 2020. The construction of 17 wells is still ongoing to prevent fires. Drilling wells were built in two large peatland villages, namely Tenan and Kundur villages. Tenan Village and Kundur Village are expected and prepared to become villages on peatland fire alert in Meranti Islands Regency based on the success of Sungai Tohor Village in peatland restoration.

The management of peatlands in the Meranti Islands Regency must continue to be carried out, considering that peatland fires are hard work that must be completed. The central government through the Peat Restoration Agency (BRG), the provincial government through the Peatland Restoration Agency TRGD and the Environmental and Environmental Health Service (DLHK), the Meranti Islands Regency government, the village government through the involvement of the Fire Care Community (MPA), as well as various stakeholders and non-governmental organizations The community (WALHI and JIKALAHARI) of course must collaborate in enforcing peatland governance regulations. Through enforcement of regulations, peatland restoration programs and innovations in peatland management will result in community welfare. This output makes people feel safe and not worried about forest and land fires that have occurred so far. Ecosystem management and peat restoration must also be carried out in an integrated manner with all aspects of strengthening regulations and collaboration between actors, qualified technology, and community participation. As an effort that has been carried out for a long time, sustainable peatland management needs more attention, considering that peatland fires are still very potential to occur. In this case, it is also necessary to apply fair roles and benefits for village communities, especially in villages located in areas prone to peatland fires in the Meranti Islands district. The village government and its staff are the implementing actors for peatland management at the primary and technical levels. Democratic governance should be enhanced by involving cross-sectoral government agencies and other stakeholders in the private sector.

Furthermore, various government collaborations in the management of peat ecosystems in the process have had a significant impact on peatland restoration in the Meranti Islands Regency. This can be seen in Table 2 which is a statistic on the number of land and forest fires in the Meranti Islands Regency from 2018-2021:

Table 2. Number of forest and land fires in Meranti Islands Regency in 2018-2021

Amount	Year
963.56 ha	2018
388.5 ha	2019
4 ha	2020
53 ha	2021

Source: Meranti Islands Regency Regional Disaster Management Agency, 2021

Based on Table 2 above, it can be seen that the number of forests and land fires in the Meranti Islands Regency tends to fluctuate and is dominated by a decline after the collaboration between the government and related stakeholders. In addition, the peatlands in the Meranti Islands Regency today are no longer like a few years ago which were very dry. Where currently the condition of the land has begun to improve and is again wet so that it has the potential to be developed into agricultural land with a record of cultivating peatland-friendly plants (sago) while maintaining environmental sustainability.

5. CONCLUSIONS

The findings of this study indicate that collaboration between the government and stakeholders and Non-Governmental Organizations (NGOs) has resulted in the progress of peat restoration in the Meranti Islands Regency, Riau Province. In implementing the peat restoration program, the government has collaborated with local governments and various non-governmental organizations that play an active role in conserving peatlands in Riau Province, namely the Indonesian Forum for the Environment (WALHI) and the Riau Forest Rescue Network (JIKALAHARI). Then, the local government together with local stakeholders continued to develop sago cultivation because this type of plant is very suitable for cultivation on peatlands which has been carried out by the people of Meranti Islands Regency. In addition, with the collaboration of the government with relevant stakeholders, the number of forests and land fires in the Meranti Islands Regency tends to decrease. Nevertheless, there are still some notes in the collaboration that occurs, namely collaboration between actors which is still incomplete because it has not involved actors in the private sector comprehensively, and there is still a lack of commitment from the Regional Peat Restoration Team (TRGD) with the Regional Government regarding efforts to support the peat restoration agenda. sustainably in the Meranti Islands Regency. Thus, government collaboration in peatland ecosystem management in the Meranti Islands Regency must continue to be carried out by involving the private sector.

This research contributes in the form of recommendations to strengthen the participation of private actors in regulating peat ecosystems to continue to improve government partnerships. The research approach of this study has limitations because it only analyzes data from a limited period. Therefore, additional research is needed to dig up information in a longer time. This study also suggests that future research should be able to fully map the participation of stakeholders in peat ecosystem governance.

ACKNOWLEDGMENT

Thank you to all those who have helped in the completion of this article, and also to the University of Riau Institute for Research and Community Service (LPPM) which has funded this research.

REFERENCES

[1] Zhong, Y., Jiang, M., Middleton, B.A. (2020). Effects of water level alteration on carbon cycling in peatlands. Ecosystem Health and Sustainability, 6(1): 1806113. https://doi.org/10.1080/20964129.2020.1806113

[2] Buschmann, C., Röder, N., Berglund, K., Berglund, Ö., Lærke, P.E., Maddison, M., Mander, Ü., Myllys, M., Osterburg, B., van den Akker, J.J.H. (2020). Perspectives on agriculturally used drained peat soils: Comparison of the socioeconomic and ecological business environments of six European regions. Land Use Policy, 90: 104181. https://doi.org/10.1016/j.landusepol.2019.104181

[3] Syahza, A., Bakce, D., Nasrul, B., Mustofa, R. (2020). Utilization of peatlands based on local wisdom and community welfare in Riau Province, Indonesia. International Journal of Sustainable Development and Planning, 15(7): 1119-1126. https://doi.org/10.18280/IJSDP.150716

[4] Iskandar, W., Watanabe, T., Marwanto, S., Sabiham, S., Funakawa, S. (2020). Landform affects the distribution of mineral nutrients in the tropical peats: A case study in a peatland of Siak, Indonesia. Soil Science and Plant Nutrition, 66(4): 602-614. https://doi.org/10.1080/00380768.2020.1783965

[5] Handoko, T., Tinov, T., Febrian, A.F., Putri, R.A., Andini, F.K., Rifansyah, O. (2020). Peatlands restoration as a potential solution to resolve peatlands damage based on sustainable development goals (SDGS) in Sungai Tohor, Indonesia. Jurnal Niara, 13(1): 123-131. https://doi.org/10.31849/niara.v13i1.3876

[6] Gaffney, P.P., Hancock, M.H., Taggart, M.A., Andersen, R. (2020). Restoration of afforested peatland: Immediate effects on aquatic carbon loss. Science of the Total Environment, 742: 140594. https://doi.org/10.1016/j.scitotenv.2020.140594

[7] Ahmad, S., Liu, H., Günther, A., Couwenberg, J., Lennartz, B. (2020). Long-term rewetting of degraded peatlands restores hydrological buffer function. Science of The Total Environment, 749(141571): 141571. https://doi.org/10.1016/j.scitotenv.2020.141571

[8] Hooijer, A., Page, S., Jauhiainen, J., Lee, W.A., Lu, X.X., Idris, A., Anshari, G. (2012). Subsidence and carbon loss in drained tropical peatlands. Biogeosciences, 9(3): 1053-1071. https://doi.org/10.5194/bg-9-1053-2012

[9] Syaufina, L. (2018). Forest and land fires in Indonesia: Assessment and mitigation. Integrating Disaster Science and Management, Elsevier, 2018: 109-121. https://doi.org/10.1016/B978-0-12-812056-9.00008-7

[10] Wahyunto, Nugroho, K., Ritung, S., Sulaeman, Y. (2014). Indonesian peatland map: Method, certainty, and uses. in Prosiding Seminar Nasional Pengelolaan Berkelanjutan Lahan Gambut Terdegradasi, 18-19 Agustus 2014.

[11] Cifor.org, Peatland Ranking by Country, Global Wetlands, 2022. https://www2.cifor.org/global-wetlands/, accessed on Jul. 15, 2022.

[12] Aprilasia.com, The Importance of Peatland Forest Protection, 2021. https://www.aprilasia.com/en/our-media/articles/the-importance-of-peatland-forest-protection, accessed on Feb. 2, 2021.

[13] Giesen, W., Sari, E.N.N. (2018). Tropical peatland restoration report: the Indonesian case. Berbak Green Prosperity Partnership, MCA-Indonesia, Jakarta. https://doi.org/10.13140/RG.2.2.30049.40808

[14] Leng, L.Y., Ahmed, O.H., Jalloh, M.B. (2019). Brief review on climate change and tropical peatlands. Geoscience Frontiers, 10(2): 373-380. https://doi.org/10.1016/j.gsf.2017.12.018

[15] Indonesia.wetlands.org, Paludiculture: Utilizing Peatlands to Keep Them Wet, Wetlands International, 2019. https://indonesia.wetlands.org/news/paludiculture-utilizing-peatlands-to-keep-them-wet/, accessed on Dec. 17, 2019.

[16] Dohong, A., Aziz, A.A., Dargusch, P. (2017). A review of the drivers of tropical peatland degradation in South-East Asia. Land Use Policy, 69: 349-360. https://doi.org/10.1016/j.landusepol.2017.09.035

[17] Jong, F.S. (2018). An overview of sago industry development, 1980s-2015. Sago Palm: Multiple Contributions to Food Security and Sustainable Livelihoods, Singapore: Springer, pp. 75-90. https://doi.org/10.1007/978-981-10-5269-9_6

[18] Rusli, Z., Rafi, M., Handoko, T. (2022). The capability of the meranti islands regency government in the development of sago based on local wisdom. International Journal of Sustainable Development and Planning, 17(1): 267-275. https://doi.org/10.18280/ijsdp.170127

[19] Syaufina, L., Abi Hamzah, A. (2021). Changes of tree species diversity in peatland impacted by moderate fire severity at Teluk Meranti, Pelalawan, Riau Province, Indonesia. Biodiversitas Journal of Biological Diversity, 22(5): 2899-2908. https://smujo.id/biodiv/article/view/8191

[20] Nurhayati, A.D., Saharjo, B.H., Sundawati, L., Syartinilia, S., Cochrane, M.A. (2021). Forest and peatland fire dynamics in South Sumatra Province. Forest and Society, 5(2): 591-603. https://doi.org/10.24259/fs.v5i2.14435

[21] Ishihara, M.I., Firdaus, R., Nakagoshi, N. (2017). Peatland fires in Riau, Indonesia, in relation to land cover type, land management, landholder, and spatial management. Journal of Environmental Protection, 8(11): 1312-1332. https://doi.org/10.4236/jep.2017.811081

[22] Badri, M., Lubis, D.P., Susanto, D., Suharjito, D. (2018). The viewpoint of stakeholders on the causes of forest and land fires in Riau Province, Indonesia. Russian Journal of Agricultural and Socio-Economic Sciences, 74(2): 4-

10. https://doi.org/10.18551/rjoas.2018-02.01%0ATHE
[23] Safitri, M.A. (2021). The prevention of peatland fires in Indonesia: 'Law in Action' to implement the ASEAN Haze Treaty. Indones. J. Southeast Asian Stud., 5(1): 1-16. https://doi.org/10.22146/ikat.v5i1.65027
[24] Foead, N. (2019). Three years of peatland restoration in Indonesia report. Jakarta. https://www.cifor.org/publications/pdf_files/infobrief/6449-infobrief.pdf.
[25] Syahza, A., Bakce, D., Irianti, M., Asmit, B., Asmit, B., Syahza, A., Hasbi, M. (2020). Potential development of leading commodities in efforts to accelerate rural economic development in coastal areas Riau, Indonesia. Journal of Applied Sciences, 20(5): 173-181. https://doi.org/10.3923/jas.2020.173.181
[26] Yuwati, T.W., Rachmanadi, D., Turjaman, M., et al. (2021). Restoration of degraded tropical peatland in Indonesia: A review. Land, 10(11): 1170. https://doi.org/10.3390/land10111170
[27] Uda, S.K. (2019). Sustainable peatland management in Indonesia: Towards better understanding of socio-ecological dynamics in tropical peatland management. Wageningen University. https://doi.org/10.18174/499309
[28] Termeer, C.J., Dewulf, A., Breeman, G., Stiller, S.J. (2015). Governance capabilities for dealing wisely with wicked problems. Administration & Society, 47(6): 680-710. https://doi.org/10.1177/0095399712469195
[29] Lang, A., Brüesch, C. (2020). Collaborative governance in program Implementation: the development of e-relocation notification in the Swiss canton of Zurich. International Journal of Public Administration, 43(12): 1083-1095. https://doi.org/10.1080/01900692.2019.1665681
[30] Wang, H., Ran, B. (2022). Network governance and collaborative governance: A thematic analysis on their similarities, differences, and entanglements. Public Management Review, 1-25. https://doi.org/10.1080/14719037.2021.2011389
[31] Bianchi, C., Nasi, G., Rivenbark, W.C. (2021). Implementing collaborative governance: Models, experiences, and challenges. Public Management Review, 23(11): 1581-1589. https://doi.org/10.1080/14719037.2021.1878777
[32] Emerson, K., Nabatchi, T., Balogh, S. (2012). An integrative framework for collaborative governance. Journal of Public Administration Research and Theory, 22(1): 1-29. https://doi.org/10.1093/jopart/mur011
[33] Batory, A., Svensson, S. (2019). The fuzzy concept of collaborative governance: A systematic review of the state of the art. Central European Journal of Public Policy, 13(2): 28-39. https://doi.org/10.2478/cejpp-2019-0008
[34] Berardo, R., Fischer, M., Hamilton, M. (2020). Collaborative governance and the challenges of network-based research. The American Review of Public Administration, 50(8): 898-913. https://doi.org/10.1177/0275074020927792
[35] Saleh, C., Hendrik, E., Zauhar, S., Nuh, M. (2021). Collaborative governance in public administration. Perspective, 56(6): 655-665. https://doi.org/10.35741/issn.0258-2724.56.6.58
[36] Permani, R. (2021). Collaborative governance in poverty reduction in Bandung City. Jurnal Ilmiah Ilmu Administrasi Publik, 11(1): 24-39. https://doi.org/10.26858/jiap.v11i1.19742
[37] Grootjans, S.J., Stijnen, M.M.N., Kroese, M.E.A.L., Ruwaard, D., Jansen, M.W.J. (2022). Collaborative governance at the start of an integrated community approach: A case study. BMC Public Health, 22(1): 1-11. https://doi.org/10.1186/s12889-022-13354-y
[38] Ansell, C., Gash, A. (2008). Collaborative governance in theory and practice. Journal of Public Administration Research and Theory, 18(4): 543-571. https://doi.org/10.1093/jopart/mum032
[39] Kirk Emerson, T.N. (2015). Collaborative Governance Regimes. Washington DC: Georgetown University Press.
[40] Budiman, I., Hapsari, R.D., Wijaya, C.I., Sari, E.N.N. (2021). The governance of risk management on peatland: A case study of restoration in South Sumatra, Indonesia. World Resources Institute (WRI): Washington, DC, USA. https://doi.org/10.46830/wriwp.20.00008
[41] Hakim, A.R., Suwitri, S., Larasati, E., Dwimawanti, I.H. (2021). Collaborative governance in peat restoration in Ogan Komering Ilir District, South Sumatra Province. In Proceedings of the 1st Tidar International Conference on Advancing Local Wisdom Towards Global Megatrends (TIC 2020), pp. 1-8. https://doi.org/10.4108/eai.21-10-2020.2311896
[42] Irwani, S., Kartodihardjo, H. (2022). Analysis of policy implementation for peatland ecosystem degradation control on community land in the Ex-PLG Area of Central Kalimantan Province. Jurnal Pengelolaan Sumberdaya Alam dan Lingkungan (Journal of Natural Resources and Environmental Management), 12(1): 34-45. https://doi.org/10.29244/jpsl.12.1.34-45
[43] Zak, D., Maagaard, A.L., Liu, H. (2021). Restoring riparian peatlands for inland waters: A european perspective. In Encyclopedia of Inland Waters, 2nd Edition, Amsterdam: Elsevier, 3: 276-287. https://doi.org/10.1016/B978-0-12-819166-8.00127-4
[44] Hergoualc'h, K., Carmenta, R., Atmadja, S., Martius, C., Murdiyarso, D., Purnomo, H. (2018). Managing peatlands in Indonesia: Challenges and opportunities for local and global communities. CIFOR Infobrief, 205. https://doi.org/10.17528/cifor/006449
[45] Sukwika, T., Febrina, L., Mulyawati, I. (2022). Institutional network of the peat ecosystem restoration plan in Riau Province: Hierarchy and classification approaches. In 2nd International Conference on Tropical Wetland Biodiversity and Conservation (IOP Conference Series: Earth and Environmental) Science, pp. 1-7. https://doi.org/10.1088/1755-1315/976/1/012019
[46] Busetto, L., Wick, W., Gumbinger, C. (2020). How to use and assess qualitative research methods. Neurological Research and Practice, 2(1): 1-10. https://doi.org/10.1186/s42466-020-00059-z
[47] Monique, H., Inge, H., Bailey, A. (2020). Qualitative Research Methods, Second Edi. London: SAGE Publications Ltd, 2020.
[48] Woolf, N.H., Silver, C. (2018). Qualitative Analysis Using NVivo: The Five-Level QDA® Method. New York: Routledge.
[49] Woods, M., Paulus, T., Atkins, D.P., Macklin, R. (2016). Advancing qualitative research using qualitative data analysis software (QDAS)? Reviewing potential versus practice in published studies using ATLAS. ti and NVivo, 1994-2013. Social Science Computer Review, 34(5): 597-617. https://doi.org/10.1177/0894439315596311

[50] BPBD. (2017). Meranti islands regency regional disaster management agency. https://pusatkrisis.kemkes.go.id/Kebakaran Hutan dan Lahan-di-MERANTI-R I A U-13-02-2017-1, accessed on Jan. 12, 2022.
[51] Silviana, S., Saharjo, B.H., Sutikno, S. (2019). Effect of wildfires on tropical peatland vegetation in Meranti Islands District, Riau Province, Indonesia. Biodiversitas Journal of Biological Diversity, 20(10): 3056-3062. https://doi.org/10.13057/biodiv/d201039
[52] Mitragambut.id, Water Level Data (TMA) on the Peatland Water Monitoring System (Sipalaga) For the Period 1-25 May 2020 From 6 Peatland Restoration Priority Provinces, 2020. http://mitragambut.id/postingan/detail/15107, accessed May 31, 2020.