# Synergistic approach in peatland fire mitigation as an impact of climate change: the role of government policy, technology, and local communities

# Synergistic approach in peatland fire mitigation as an impact of climate change: the role of government policy, technology, and local communities

**Deasy Arisanty[1*], Karunia Puji Hastuti[1], Nevy Farista Aristin[1], Iya Setyasih[2] and Syahril[3]**

[1] Department of Geography Education, Lambung Mangkurat University, Banjarmasin, Indonesia
[2] Department of Geography Education, Mulawarman University, Samarinda, Indonesia
[3] Doctoral Program of Education Management, Pakuan University, Bogor, Indonesia

[*]E-mail: deasyarisanty@ulm.ac.id

**Abstract**. Fires that often occur in peatland areas in South Kalimantan require serious handling. Fire mitigation is the most effective measure to minimize the impact of a fire. Through synergy between government policies, the use of technology as an early warning system, and the role of local communities in mitigating peatland fires, it is hoped that fire management will be overcome more quickly. This study aims to analyze synergies in peatland fire mitigation through government policies, technology, and the role of local communities. Data were collected through field observations and in-depth interviews with local government agencies, including the Regional Disaster Management Agency. Additionally, interviews were conducted with community groups, including the fire brigade and the disaster care community. The study results indicate that government policies play a crucial role in mitigating peatland fires. However, some obstacles, such as coordination among institutions involved in fire management, remain low. Additionally, it is essential to utilize technology as an early warning system for fires and to extinguish them promptly when they occur. The obstacle identified is that a limited amount of technology is still used in peatland fire mitigation. Community participation and government synergy in tackling peatland fires through the use of various technologies are essential to overcoming this problem.

## 1. Introduction

Peatlands are ecosystems that store large amounts of carbon reserves, making them highly vulnerable to fire, mainly due to increased pressure from anthropogenic activities [1]. The practice of draining peatlands for agricultural expansion, plantations, and other development activities has been proven to significantly increase the risk of fire because it reduces soil moisture and accelerates the oxidation process of organic matter [2]. Degradation of peat ecosystems not only triggers fires, but also contributes to increased greenhouse gas emissions from intensive agricultural activities, land clearing, and biomass burning around peat areas [3]. Therefore, the protection and sustainable management of peatlands is a priority in climate change mitigation and disaster risk reduction efforts.

Community-based peatland management is a relevant and adaptive mitigation strategy in facing the risk of peatland fires. Local communities have ecological wisdom and land management practices that have been proven to maintain the balance of the peat environment for generations [4]. Social capital that grows from cultural values and local wisdom has been shown to strengthen communities' collective capacity to prevent and respond to fire events, making it an essential asset in community-based disaster risk management systems [5]. Wise land management has been an integral part of the lives of indigenous and local communities in Indonesia; however, demographic pressures and rising land needs have led to the expansion of peatland utilization, often at the expense of sustainability [6]. In this context, the way communities interact with peat ecosystems (through spatial understanding, traditional agricultural practices, and natural cycles) determines the long-term success of peatland management and restoration [7].

Government policy, technology adoption, and community participation are the three main pillars that complement each other to reduce the risk of peatland fires. Policies designed by the government have a strategic role in shaping the regulatory and institutional framework, although their implementation is faced with various challenges, such as weak coordination across sectors and overlapping authority between institutions [8]. Sectoral interests are one of the main obstacles in synchronizing policy implementation in the field, thus reducing the effectiveness of fire control [9]. The success of policy implementation can be measured by indicators such as reductions in the affected area and the number of hotspots. The reduction in both indicators, accompanied by adaptive policy correction and improvement efforts, shows that government intervention has a significant contribution in controlling forest and land fires [10]. Thus, the synergy between policy direction, appropriate technology, and active community involvement is a crucial foundation for building an effective and sustainable fire mitigation system.

The use of technology in peatland fire management plays a crucial role in significantly reducing fire risk through preventive efforts and rapid response to field events. One of the preventive approaches that can be applied is weather modification technology to increase air humidity and reduce fire potential in the dry season [11]. In addition, early warning systems based on remote technology and cellular networks have proven effective in detecting changes in environmental conditions and providing real-time information to prevent the spread of fires [12]. The integration of Internet of Things (IoT) technology with the *Fire Weather Index* (FWI) also enhances prediction accuracy and informs decision-making in fire mitigation efforts in vulnerable areas. Therefore, the mastery of technology by communities and local governments is an essential element for strengthening adaptive, sustainable peatland fire management.

Effective peatland fire management requires a community-based approach that is responsive and adaptive to local dynamics. Community involvement through volunteer organizations, such as Disaster Care Community *or Masyarakat Peduli Bencana* (MPB) and Fire Care Community or *Masyarakat Peduli Api* (MPA), has shown significant contributions to peatland fire prevention and management [13]. The activities of these groups not only reflect a high level of ecological awareness but also demonstrate that the communities have developed a sufficient technical understanding of fire suppression methods, early monitoring, and fire risk management. In addition, local communities have also been able to adapt to the challenges of climate change that affect extreme weather patterns and peatland conditions, thus strengthening their resilience capacity in the face of fire disasters [13].

Peatland fires in the Banjarbaru region of South Kalimantan are a frequent occurrence during the dry season and pose a serious threat to environmental safety and the community's socio-economic activities. The burnt peatland area is adjacent to Syamsudin Noor International Airport,

making fire control a strategic priority due to its impact on flight safety [13]. In this context, integrating government policy, utilizing technology, and actively involving local communities is an essential approach to creating an effective and sustainable fire mitigation system. Therefore, the purpose of this article is to analyze the synergy among government policy, technological mastery, and local communities' roles in peatland fire mitigation.

## 2. Methods

This research was conducted in the Banjarbaru region, South Kalimantan. Banjarbaru is located at coordinates $3^0$25'40" S-$3^0$28' 37" S and $114^0$41'22" E-$114^0$54'25" E [14]. Data were obtained through observations and interviews with the Banjarbaru Regional Disaster Management Agency and community groups, including members of the fire brigade and disaster care communities. Observations and interviews were conducted from May to July 2025. Interviews in this study focused on local government policies, particularly those related to peatland fire management and policy implementation at the government level, the technology used, and the synergy between peatland fire management implemented by the Regional Disaster Management Agency (BPBD) and community groups, including the fire brigade (BPK) and the disaster care community (MPB). Interviews with community groups regarding policy implementation in peatland fire management, the technology used by community groups, and the synergy between community groups in peatland fire management. The list of interview questions is in Table 1.

**Table 1**. List of interview questions

| Rationale | Question |
|---|---|
| Government policy | • What is the local government policy for peatland fire management?<br>• Does BPBD have a policy document on peatland fire management?<br>• How is the policy implemented when fires occur?<br>• What are the obstacles and constraints in implementing the policy? |
| Technology mastery | • What technology does the BPBD or community have for peatland fire management?<br>• How do the BPBDs and communities effectively utilize these technologies?<br>• What efforts are made by BBPD and the community to improve their mastery of technology?<br>• Are there any barriers or constraints that BPBD and the community have in using technology? |
| The synergy between the government and community groups | • What is the form of cooperation between BPBD and the community in managing peatland fires?<br>• What are the roles of BPBD and the community in suppressing land fires?<br>• What are the obstacles and constraints that occur in the field when peatland fires occur?<br>• What efforts are being made by BPBD and the community to achieve synergy in peatland fire management? |

Validate the findings in this study by examining the results of field observations and interview results from sources. Data analysis using triangulation includes data reduction, display, and verification. Data reduction in the form of selection, separation, attention to simplification, abstraction, and transformation of rough data that emerged from written notes in the field. Data presentation in the form of describing the results of interviews, expressed in the form of descriptions with narrative text and supported by documents, as well as photos and similar images. Conclusions were drawn by distilling the essence of a series of research categories based on observations and interviews.

## 3. Results and Discussion

### *3.1 Government Policy on Peatland Fire Management*

The Indonesian government has implemented various strategic policies to address recurring peatland fires, particularly in Kalimantan and Sumatra. These policies are not only repressive through law enforcement against illegal burning, but also preventive through the restoration of peat ecosystems and the strengthening of institutions. One crucial step is the establishment of the Peat and Mangrove Restoration Agency (BRGM), which is tasked with restoring peat hydrology by constructing canal blocks and boreholes and revitalizing community-based land governance. In addition, the moratorium policy on peatland clearing stipulated in Presidential Instruction No. 5 of 2019 also plays a significant role in preventing the conversion of peatlands into fire-prone areas [15].

The policy implementation is strengthened by a spatial data-based approach and an integrated early warning system for forest and land fires, implemented within the Ministry of Environment and Forestry's *Sipongi Dashboard* system. The government also involves various parties, including the Indonesian National Army, the police, local governments, the business sector, and local communities, to form a collaborative forest and land fire task force. However, challenges in inter-agency coordination, limited human resources in the field, and funding sustainability are still significant obstacles in implementing this policy [16]. Therefore, the effectiveness of peatland fire management policy depends on cross-sectoral synergy, transparency in monitoring, and community capacity building for sustainable land management.

An interview with the Head of MPB in Cempaka Village revealed a gap between local government policy and its implementation in the field. The head of MPB said, *"The government has indeed formed MPB in each village, but until now, we have not received a written guidebook or SOP. We work based on experience only. "* This indicates that technical implementation instruments at the community level have not followed institutional policies.

In line with these findings, research [17] revealed that the effectiveness of community institutions in disaster management is strongly influenced by the clarity of structure, function, and operational guidelines provided by the central and local governments. Without concrete policy documents, community initiatives are vulnerable to becoming undirected and unmeasurable. On the other hand, BPBD acknowledges that policy documents exist in an internal form, but have not been conveyed to all MPBs. One BPBD staff member stated, *"We have an SOP, but not all MPBs have received it because the distribution is gradual and requires training first."*

Similarly, [15] noted that many community-based disaster risk reduction initiatives have stagnated due to a lack of alignment between national/regional policies and local implementation, particularly in procedural documentation and human resource support. Although there is a gap between government policy and implementation in the field, MPB in Cempaka Sub-district, Banjarbaru, plays an active role in delivering disaster information directly

to the local Disaster Management Agency (BPBD). This mechanism enables early detection of potential disasters, particularly peatland fires, thereby accelerating decision-making at the regional level. In addition to relaying information, MPB is directly involved in field fire response, including monitoring, early extinguishing, and assisting affected communities. Most MPB volunteers in the region are members of the community fire brigade, which operates alongside professional firefighting units to respond to fire incidents quickly and effectively.

The role of MPB in fire-prone areas, such as Cempaka Sub-district, strengthens local capacity within a community-based disaster management system. The existence of this group not only serves as an information conduit between the community and the BPBD but also plays an active role in early detection, rapid response, and field fire control. MPB involvement in fire suppression operations is often done collaboratively with firefighting ranks, including assisting with fire mapping and emergency logistics distribution [18]. This collaboration accelerates emergency response time and reduces the risk of widespread fire escalation, especially in flammable, difficult-to-extinguish peat areas.

The active involvement of MPB in Banjarbaru also shows the importance of participatory approaches in building community resilience to disasters. Periodic training programs conducted by BPBD and related agencies have improved the community's technical knowledge on fire suppression, the use of micro-weather monitoring devices, and fire blocking techniques in peatlands [19]. Recent studies suggest that the effectiveness of disaster management increases when communities are involved from the planning stage to the execution of emergency measures [20]. Therefore, institutional strengthening of MPB through sustainable funding, technical training, and integration into the regional disaster management command system is a strategic step toward improving field-level fire mitigation.

One of the main obstacles to implementing peatland fire management policies is recruiting volunteers, who typically come from the general public and lack formal education or specialized training in disaster management. This lack of knowledge of mitigation techniques, safety, and the use of extinguishing equipment has limited volunteers' effectiveness in the field. Therefore, a structured, sustainable training program is urgently needed to enhance volunteers' technical capacity to respond to peatland fire emergencies. This training aims not only to improve practical skills but also to strengthen volunteers' understanding of standard operating procedures and cross-sector coordination within the disaster management system.

### *3.2 Technology Mastery in Peatland Fire Management*

The mastery of technology is a crucial element in efforts to suppress peatland fires in Indonesia, especially given the flammable nature of peat, which makes it difficult to extinguish; fires can spread underground. The government and related institutions have utilized satellite-based monitoring technology, such as *MODIS* and *LAPAN Fire Hotspot*, to detect hotspots in real-time and predict the potential spread of fire [21]. In addition, an early warning system integrated with remote sensing technology and drone imagery further enhances the accuracy of early detection and accelerates firefighting responses [22]. IoT (Internet of Things)-based peat moisture sensors are also being adopted to monitor peat hydrological conditions, enabling preventive action before the drought threshold is reached.

In the field, high-pressure suppression technologies, such as water mist systems, and the use of portable hydrant pumps and environmentally engineered canal barriers have proven effective in inhibiting the spread of fire in vulnerable areas [23]. However, the main challenge in mastering these technologies is the limited technical capacity of local officials, as well as the high operational and maintenance costs associated with the devices. Therefore, a technology transfer strategy is

needed through integrated training, strengthening universities' roles, and involving local communities in managing simple technologies that are adaptable to local geographical conditions [24]. With an appropriate technological approach, the success of peat fire mitigation will increase, and the risk of disaster can be significantly reduced.

The MPB community in Cempaka Sub-district, Banjarbaru, is also constrained in mastering peatland fire management technology. An MPB member revealed, *"We only use makeshift tools, such as buckets and hoses from home. We have never been trained using advanced equipment such as pressure water pumps or drones."* This shows that there has been no systematic transfer of technology from the government to the community. Meanwhile, the BPBD also gave a statement that reinforced this condition: *" We have a few tools, but they are limited. The focus of the training is only carried out at the district or city level, not yet touching all villages."* The limited technology available to the community results in slow, manual responses to fires.

MPB groups in peatland fire-prone areas often lack access to adequate technological tools to support disaster management efforts. Mastery of technology within the community remains minimal, as there has been no systematic, sustainable technical training program. Until now, government support in the form of technological facilities, especially fire-monitoring or suppression equipment, has not been optimally available at the community level. This condition has led to a community dependence on traditional methods that are less effective in addressing the complexity of peatland fires. Therefore, MPB urgently requires intervention from the BPBD, including the procurement of appropriate tools and comprehensive technical training, to increase the community's capacity to operate and utilize technology effectively.

Limited mastery of disaster management technology remains a significant challenge in managing peatland fires at the local community level. Although volunteer groups have been formed and have shown high commitment to field activities, their technical capacity generally relies on conventional manual methods. The use of cutting-edge technology has not supported it. The lack of technical training and access to modern equipment has prevented suppression efforts from achieving optimal efficiency. In addition, limited funding is a significant constraint, as the cost of procuring extinguishers, monitoring sensors, and early-detection technologies often exceeds the budgets of local communities and institutions.

Research [25] confirms that the technical ability of communities to use extinguishers and early detection technology is a key factor in reducing the area burned. However, without consistent training and appropriate tools, this potential cannot be optimized. Research by [26] also states that low technological literacy among volunteers leads them to rely on conventional methods that are ineffective in complex peat ecosystems.

### *3.3 The synergy between government and community groups*

Synergy between the government and community groups is key to sustainable and effective peatland fire management. The government's top-down approach, which is normative and structural, needs to be complemented by a bottom-up approach that emphasizes the active role of the community as the leading actor in the field [27]. Programs such as Peat Care Village or *Desa Peduli Gambut* (DPG), initiated by the Peat and Mangrove Restoration Agency (BRGM), are concrete examples of such synergy, in which communities are involved in water management, land monitoring, and early firefighting training. Through this participatory approach, the community is not only the object of policy but also an empowered subject in protecting the peat ecosystem from the threat of fire.

However, the effectiveness of this synergy is strongly influenced by open two-way communication, equality in decision-making, and the sustainability of resource support and

incentives for local communities. Research [28] shows that strong synergies between village governments, farmer groups, and security forces can reduce the frequency of land fires by up to 60% in some areas of Central Kalimantan. To strengthen this partnership, it is necessary to enhance the community's institutional capacity, establish a system of result-based incentives, and integrate fire management programs into village development plans. Thus, synergy between the government and community groups is not only a technical strategy, but also a social-ecological approach that can build community resilience to the threat of peat fires.

The synergy between BPBD and community groups, such as MPB and BPK, is considered established; however, it remains neither systematic nor sustainable. The head of BPK Trisakti said, " *We often get off first because the location is closer. But if there is no water or tools, we can't help much. Sometimes assistance from BPBD only comes when the fire has spread widely.*" This shows that there are obstacles in coordinating the timing and distribution of resources. One MPB member also added, " *We want to be more involved in training or simulation, not just as a reporter. But so far we have only been told to convey information if there is a fire.*"

Cooperation between the BPBD and the community, primarily through the MPB group, is established through reporting and coordination mechanisms when peatland fires occur. MPB serves as the frontline, providing initial information on the location, intensity, and current condition of fires, which BPBD then follows up on by mobilizing resources, including water, firefighting equipment, and additional personnel. BPBD's response to MPB reports is generally quick and structured, reflecting the importance of communication networks between communities and government institutions. However, the role of the community in the execution phase of fire suppression remains limited; most community contributions are informative, while technical implementation on the ground is primarily carried out by the BPK, which has greater operational capacity.

Research [29] revealed that the success of peatland fire management is highly dependent on the formal collaboration structure between the government and the community. If the community's role is limited to serving as informants, the collective potential for mitigation will not be optimized. Research [30] also confirms that joint planning, role-sharing, and collective training between the government and local communities are crucial elements in building resilience against forest and land fires.

One of the significant obstacles to peatland fire management in the field is limited operational facilities, especially transportation, which makes it difficult to mobilize to the fire hotspot, especially in remote or difficult-to-access areas. This condition is exacerbated when fires co-occur across multiple locations, leading to the distribution of aid and resources from the BPBD and, in turn, reducing the effectiveness of the response. To overcome these challenges and strengthen coordination among actors, BPBD, together with MPB, BPK, and residents, established a cooperation mechanism based on intensive communication and a clear division of roles. This effort aims to establish a coordinated, sustainable collaboration to enhance the capacity for collective, responsive peatland fire management.

The findings of this study show that peatland fire suppression efforts require strengthening community capacity through ongoing technical training and the provision of clear operational documents. Community access to fire suppression technology also needs improvement through the distribution of appropriate tools and hands-on training in their use. Additionally, regular coordination forums between the local government and community groups are necessary to strengthen communication and establish a structured process for sharing roles. To sustain community participation, incentivizing MPB and BPK volunteers is essential, ensuring their

involvement is not only situational but also integrated into a sustainable disaster management system.

Based on the study results, it is recommended that local governments immediately formulate and socialize formal operational documents, such as SOPs and training modules, for MPB and BPK, to ensure more systematic field implementation. The government also needs to develop a community-based technology transfer program that involves both the academic and private sectors to enhance the effectiveness of early detection and fire response. In addition, integrating forest and land fire management programs into regional development plans is essential to ensure the sustainability of regulatory and budgetary support. In addition, regulations are needed to strengthen cross-sector collaboration among BPBD, MPB, BPK, and other local stakeholders, creating a responsive and adaptive peatland fire mitigation system.

## 4. Conclusion

Peatland fire management in Cempaka Village demonstrates that community institutions, such as MPB and BPK, are now integral to the local government's strategy. However, their effectiveness remains limited due to the lack of comprehensive operational policy documents, limited technological mastery at the community level, and weak synergy between BPBD and the community. Reliance on manual methods and incidental communication indicates the need for systemic improvements in regulatory, technical, and coordination aspects. Therefore, an integrated approach that emphasizes community-based technical training, equitable technology transfer, and strengthening cross-sector collaboration mechanisms is necessary as the primary foundation for building resilience to peatland fires in a sustainable manner.

## References

[1] Tan ZD, Carrasco LR, Sutikno S, Taylor D. Peatland restoration as an affordable nature-based climate solution with fire reduction and conservation co-benefits in Indonesia. Environmental Research Letters. 2022 May 27;17(6):064028.

[2] Carmenta R, Zabala A, Trihadmojo B, Gaveau D, Salim MA, Phelps J. Evaluating bundles of interventions to prevent peat-fires in Indonesia. Global Environmental Change. 2021 Mar 1;67:102154.

[3] Terzano D, Attorre F, Parish F, Moss P, Bresciani F, Cooke R, Dargusch P. Community-led peatland restoration in Southeast Asia: 5Rs approach. Restoration Ecology. 2022 Nov;30(8):e13642.

[4] Utami W, Salim MN. Local Wisdom as a peatland management strategy of land fire mitigation in Meranti regency, Indonesia. Ecology, Environment. & Conservation. 2021;27(1):127-37.

[5] Arisanty D, Rajiani I, Mutiani M, Hastuti KP, Abbas EW, Rosadi D, Muhaimin M. Social capital of Banjarese for peatland fire mitigation: Combining of local wisdom and environment. World. 2023 Nov 10;4(4):745-57.

[6] Krisnawati H, Adinugroho WC, Imanuddin R. Climate-responsible management of tropical peatlands: the need for integrated MRV for tropical peatland ecosystem. InTropical Peatland Eco-management 2021 Apr 10 (pp. 443-462). Singapore: Springer Singapore.

[7] Tan ZD, Sutikno S, Carrasco LR, Taylor D. Local community representations of tropical peatlands and implications for restoration in Riau, Indonesia. Restoration Ecology. 2023 Jul;31(5):e13900.

[8] Dharma AB, Yuliani F. Optimizing Peatland Fire Mitigation Policy Through Technology and Innovation. TEC EMPRESARIAL. 2025 Apr 17;20(1):333-52.

[9] Arisanty D, Putro HP, Hastuti KP, Rosadi D, Rajiani I, Muhaimin M. Integrating governments bodies in peatland environmental management to eliminate the sectoral Egos. Procedia Environmental Science, Engineering and Management. 2021;4:783-92.

[10] Zulkifli A, Ariyanto A, Dulhakim T. Historical study of peat protection policy to prevent forest and land fires in Indonesia (1990-2020). InIOP Conference Series: Earth and Environmental Science 2021 Nov 1 (Vol. 905, No. 1, p. 012069). IOP Publishing.

[11] Tukiyat T, Sakya AE, Widodo FH, Fadhillah C. Contribution of Weather Modification Technology for Forest and Peatland Fire Mitigation in Riau Province. International Journal of Disaster Management. 2022 Jul 14;5(1):70-7.
[12] Arisandi D, Syamsuadi A, Trisnawati L. Enhancing peatland fire prevention: an incremental LoRa and mobile-based early warning system. International Journal of Advanced Technology and Engineering Exploration. 2023 Nov 1;10(108):1368.
[13] Arisanty D, Hastuti KP, Setyasih I, Rosadi D, Aristin NF. Community capacity building for reducing the risk of peatland fire in wetland area. InIOP Conference Series: Earth and Environmental Science 2025 (Vol. 1438, No. 1, p. 012048). IOP Publishing.
[14] Arisanty D, Hastuti KP, Rajiani I, Rosadi D, Syahril. Community empowerment for reducing the risk of peatland fires in the wetland area of South Kalimantan. Disaster Advances 2024;17(6):1-8.
[15] Marchezini V, Trajber R, Olivato D, Munoz VA, de Oliveira Pereira F, Oliveira Luz AE. Participatory early warning systems: Youth, citizen science, and intergenerational dialogues on disaster risk reduction in Brazil. International Journal of Disaster Risk Science. 2017 Dec;8(4):390-401.
[16] Chokkalingam U, Kurniawan I, Ruchiat Y. Fire, livelihoods, and environmental change in the Middle Mahakam peatlands, East Kalimantan. Ecology and Society. 2005 Jun 1;10(1).
[17] Purnomo H, Puspitaloka D, Okarda B, Andrianto A, Qomar N, Sutikno S, Muhammad A, Basuki I, Jalil A, Prasetyo P, Kusumadewi SD. Community-based fire prevention and peatland restoration in Indonesia: A participatory action research approach. Environmental Development. 2024 Jun 1;50:100971.
[18] Marnelly TR. Community Fire Care Institutions: A Study of Role Implementation Barriers. Journal of Anthropology: Socio-Cultural Issues 2019;20(2):223-30.
[19] Serang LDIK. Analysis Of Forest And Forest Fire Disaster Risk. Journal of Disaster Mitigation Science and Technology 2018;13(1).
[20] Rahman A, Yuliani F. Mitigasi bencana kebakaran lahan gambut dan pemberdayaan masyarakat melalui metode restorasi. Sosio Informa. 2018 Aug 24;4(2).
[21] Mareta L, Hidayat R, Hidayati R, Latifah AL. Influence of natural and anthropogenic factors on the extent of forest and land fires in Kalimantan. Journal of Soil and Climate 2019;43 (2):143-51.
[22] Adinugroho WC, Suryadiputra INN, Saharjo BH. Guidelines for controlling forest and peatland fires. wahyu catur adinugroho, 2005.
[23] Riyadli H, Arluyana A. Rapid Response Information System for Peatland Fire Management in Palangka Raya City. Journal Speed-Sentra Research Engineering and Education 2020;12 (1).
[24] Yuliani F, Saputr T. Policies For Overcoming Forest And Land Fires On Peatlands From The Perspective Of Inter-Organizational Networks In Indonesia. BiLD Law Journal. 2023;8(1):53-61.
[25] Ariyanto D. Institutional coordination in improving the effectiveness of regional disaster management agencies. Journal of management Review 2018;2(1):161-71.
[26] Fathoni S, Nabella N. VN, & Prayoga, MBR (2023). Application of Technology in Disaster Mitigation Efforts of Forest and Peatland Fires in Riau Province to Support National Security," Riau Journal of Empowerment 2023;6(1):53-71
[27] Dani R, Yoza D, Sulaeman R. Community Empowerment Strategy in Forest and Land Fire Management in Rokan Hilir Regency. Online Journal of Students of the Faculty of Agriculture, Riau University 2015;2(1):1-12
[28] Maksum MA, Zulkarnain DI. Strategy Model for Prioritizing Human Resources Capacity Development Program for Forest and Land Fire Control. Journal of Forestry Social and Economic Research 2020;17(3):165-75.
[29] Waldi RD, Saharjo BH, Albar I. Influence of Internal and External Farmer Factors on Peatland Fire Prevention. Journal of Tropical Silviculture 2019;10(2):83-8.
[30] Rianawati F. Assessment of Causal Factors and Efforts to Control Peatland Fires by Communities in Salat Makmur Village, South Kalimantan. Journal of Tropical Forests 2005;6(17).