International Journal of Safety and Security Engineering
Vol. 15, No. 4, April, 2025, pp. 699-707
Journal homepage: http://iieta.org/journals/ijsse

Political Dynamics of Innovative Policy Development in Managing Forest Fires in Riau Province

Dita Fisdian Adni[1*], Christine B Tenorio[2], Evi Zubaidah[3]

[1] Department of Government Science, Faculty of Social and Political Sciences, Universitas Islam Riau, Pekanbaru 28284, Indonesia
[2] Department of Political Science, Mindanao State University-Iligan Institute of Technology, Iligan City 9200, Philippines
[3] Department of Public Administration, Faculty of Social and Political Sciences, Universitas Islam Riau, Pekanbaru 28284, Indonesia

Corresponding Author Email: ditafisdianadni@soc.uir.ac.id

https://doi.org/10.18280/ijsse.150406

Received: 9 February 2025
Revised: 24 March 2025
Accepted: 9 April 2025
Available online: 30 April 2025

Keywords:
forest fires, environmental politics, political dynamics, innovative policies, collaboration

ABSTRACT

This research examines the influence of political dynamics on the development of forest fire management policies in Riau Province, Indonesia, which is a serious environmental problem with broad impacts on ecosystems, health, and the economy. In the context of this research, innovative policy refers to public policies that contain new approaches or creative solutions that differ from conventional practices in their formulation, implementation, and evaluation. These policies aim to increase the effectiveness of forest fire management and strengthen community participation and collaboration between stakeholders. Using a qualitative approach, data was collected through in-depth interviews, observation, and analysis of policy documentation and historical data. This study involved 15 key informants selected purposively based on their strategic involvement. The informants comprised four local government officials, three legislative members, four environmental NGO leaders, and four local community representatives. The main findings in this research show that interactions between several political actors, such as the government, legislature, NGOs, and the private sector, strongly influence forest fire management policies in Riau Province. Although local governments have implemented policies such as Regional Regulation Number 1 of 2019 and the Fire Control Task Force, budget fluctuations and changes in political priorities ahead of elections often affect the effectiveness of these policies. The involvement of the legislature and the private sector has positively impacted technical and financial support and a negative impact on short-term political interests. Policy sustainability relies heavily on balancing political interests with environmental protection. To achieve this, innovative policy development can be carried out through strengthening multi-actor collaboration, utilizing advanced technology such as satellite monitoring, and accurate data-based policies, which enable more targeted interventions and more efficient responses to political dynamics and long-term sustainability. In conclusion, the success of forest fire management in Riau depends on the ability to maintain policy consistency despite changes in political dynamics, as well as the importance of strengthening multi-actor collaboration and utilizing technology in formulating sustainable and effective policies.

1. INTRODUCTION

Forest fires in Riau Province, Indonesia, have become a serious environmental problem with widespread impacts on ecosystems, public health, and the economy [1]. The frequency and intensity of forest fires in Riau, especially during the dry season, have increased significantly in recent decades [2]. Deforestation, land use change, and climate change contribute to the increased risk of forest fires [3]. Even though several mitigation efforts have been carried out, there are still significant challenges in implementing effective and sustainable policies to deal with this problem comprehensively [4].

Forest fires in Riau cause direct damage to the ecosystem, such as loss of biodiversity and destruction of wildlife habitat, and have significant long-term impacts on public health and the local economy [5]. The smoke produced from these fires' spreads over more expansive areas, causing severe air pollution and increasing respiratory disorders and cardiovascular diseases among the population [6]. Economically, forest fires cause significant losses in the agricultural and plantation sectors, threaten farmers' livelihoods, and increase management and recovery costs [7]. Fires also exacerbate climate change by releasing large amounts of carbon dioxide into the atmosphere, exacerbating the greenhouse effect [8].

In general, the government's role in dealing with forest fires includes the development and implementation of comprehensive policies [9, 10], risk management [11], and coordination between several institutions and stakeholders [12]. Governments are responsible for establishing regulations prohibiting practices that increase the fire risk, such as land clearing by burning and deforestation [13, 14]. Governments also need to implement monitoring and early warning systems [15-17], and provide resources and training for emergency response and post-fire recovery [18-20]. In addition, the government must also work with local communities, the private sector, and international organizations to share knowledge, technology, and resources to address forest fires effectively [21]. This integrated approach helps in risk mitigation, rapid response, sustainable recovery, and ensuring environmental sustainability and community well-being.

On the other hand, political dynamics also play a key role in the development of innovative policies for forest fire management by influencing priorities, resource allocation, and implemented strategies [22-24]. On the part of governments and other interest groups, different political interests can direct policy focus on solutions that may be more politically advantageous than those most environmentally effective [25, 26]. In addition, political dynamics also influence the level of support or resistance to proposed policies, influencing the implementation and success of coping strategies [9]. Therefore, understanding the correlation between political dynamics and innovation policy is crucial for designing policies that are not only innovative but also acceptable and effectively implemented in the existing political context.

The policy network theory approach is used as a theoretical basis for understanding the dynamics of interactions between actors in formulating and implementing forest fire control policies. This theory emphasizes that public policy is not solely determined by the government but results from complex interactions between various actors, including government institutions, legislative institutions, civil society organizations, and local communities [27]. In the context of forest fire management in Riau, this theory is relevant for analyzing how various actors' alliances, interests, and resources influence the direction of policy and its success.

Several previous studies have highlighted how political dynamics can either strengthen or weaken the effectiveness of environmental policies. For example, the findings of one study showed that economic interests and political power often dominate natural resource management policies in Indonesia, resulting in weak environmental protection [28]. Meanwhile, other studies emphasize the importance of community participation in creating sustainable environmental policies [29]. Thus, this study seeks to fill a gap in the literature by exploring how interactions between actors in policy networks influence government responses to forest fires and how innovative policies can emerge in complex political contexts.

The research gap in this study lies in the lack of in-depth understanding of how political dynamics specifically influence the development and implementation of forest fire management policies in Riau, Indonesia. Although many studies have discussed environmental policy and forest fire management, little research has integrated political analysis with environmental policy in regions with unique challenges, such as Riau. The absence of studies exploring the relationship between political interests, government policies, and the participation of interested actors in forest fire management indicates a gap in the literature that needs to be filled to develop more effective and sustainable policies.

The primary problem formulation in this research is how political dynamics influence the development of innovative policies for managing forest fires in Riau. Specifically, this research explores how political interests, government policies, and community participation influence the effectiveness of fire management policies. In addition, this research identifies barriers and opportunities in developing innovative and sustainable policies to address the problem of forest fires more effectively. Answering this problem statement will provide an in-depth understanding of how political factors influence the effectiveness of forest fire management policies and help identify obstacles and opportunities in developing more innovative and sustainable policies. The results of this research can increase the effectiveness of forest fire management policies by providing strategic recommendations that consider political dynamics and community participation.

This research aims to analyse how political dynamics influence the development of innovative policies in managing forest fires in Riau Province. This research aims to identify the relationship between political interests, government policies, and actor participation and how these factors influence the effectiveness of the policies implemented. This research also seeks to explore obstacles and opportunities in developing more innovative and sustainable policies, focusing on strategies that can integrate environmental, social, and economic aspects more comprehensively. It is hoped that the results of this research can provide strategic recommendations to increase the effectiveness of forest fire management policies by considering the complexity of the political context, local challenges, and the importance of the participation of several stakeholders.

2. METHOD

This qualitative research method includes in-depth interviews, observation, and documentation to explore how political dynamics influence forest fire management policies in Riau. Data was collected through interviews with key informants such as local government officials, legislative members, NGO leaders working in the environmental sector, and representatives of local communities affected by the fires. The selection of key informants, such as local government officials, legislative members, environmental NGO leaders, and local community representatives, was based on their strategic role in the issue of forest fire management. Local government officials and legislative members have the authority to formulate, implement, and evaluate public policies, so their insights are important for understanding the dynamics of political decision-making. NGO leaders working in the environmental sector offer independent perspectives and an in-depth understanding of the challenges and practical solutions in dealing with forest fires. Meanwhile, local community representatives provided empirical information regarding the direct impact of forest fires on people's lives and the effectiveness of policies that have been implemented. The combination of insights from these groups ensures rich and diverse data to explore the relationship between political dynamics, innovative policies, and citizen participation.

This study involved 15 key informants purposively selected based on their strategic involvement in forest fire control issues in Riau Province. The informants comprised four local government officials, three legislative members, four

environmental NGO leaders, and four local community representatives. The definition of innovative policy in the context of this study refers to public policies that contain new approaches or creative solutions that differ from conventional practices, both in formulation, implementation, and evaluation, which aim to increase the effectiveness of forest fire management and strengthen community participation and collaboration between stakeholders.

Apart from interviews, observations were carried out on activities related to forest fire management, such as policy meetings, mitigation training, and community programs. Observations of forest fire management activities provide a direct understanding of implementing policies and strategies in the field. It also helps identify practical challenges and the level of participation and collaboration between stakeholders. Relevant documentation, including police reports, planning documents, and historical data on forest fires, was also collected to complement primary data from interviews and observations. The collection of relevant documentation, such as police reports and planning documents, is carried out to provide the context and formal framework underlying forest fire management policies. Historical data on forest fires is used to analyze trends, patterns, and causal factors chronologically. This approach complements primary data with an objective and evidence-based perspective to produce a more comprehensive analysis.

The procedures for this research began with data collected from interviews and observations thoroughly transcribed to ensure the accuracy and integrity of the information. The transcription process involves converting verbal recordings into complete written text, then coded using the NVivo 12 Plus analysis tool. This coding aims to identify themes and patterns in qualitative data. The validity of the data was checked through triangulation, which involves comparing and verifying findings from several data sources (interviews, observations, and documentation) and validation by key informants to ensure that the analysis reflects an accurate and reliable perspective. The data processing and analysis stage is carried out by presenting, reducing, and drawing conclusions. The research results that have been processed are then analyzed to answer the research problem formulation. The research results obtained are then compiled and reported to inform the progress of the research results.

3. RESULTS

This section presents research results and discussions regarding forest fires in Riau Province, focusing on how political dynamics influence the development of innovative policies for fire management. The analysis includes obstacles faced in implementing policies and opportunities that can be exploited to create sustainable solutions. These findings are expected to provide in-depth insights and strategic recommendations for policy makers and related stakeholders.

The number of cases of forest fires that occurred in various provinces in Indonesia throughout 2023. This data provides an overview of the distribution and frequency of forest fires which are a serious challenge in environmental management and disaster management policies in Indonesia. The percentage of Riau Province is ranked 5th as the region with the highest number of cases in Indonesia.

The forest fires in Riau Province are important to discuss because of their broad impact on the environment, public health, and the economy at the local and regional levels. Additionally, understanding the causes and dynamics of these forest fires can help design more effective future mitigation and prevention policies. The number of cases of forest fire disasters in Riau Province 2021-2023 is as follows:

Political dynamics in Riau Province play an important role in the development of innovative policies for forest fire management. The influence of several political interests, both at the regional and national levels, also shapes the policy direction local governments take in dealing with this problem. The following are several dominant actors who influence the political dynamics of developing innovative policies to manage forest fires in Riau Province.

The following are several main points regarding opportunities in developing innovative and sustainable policies for managing forest fires in Riau Province:

Strengthening multi-actor collaboration, utilizing digital technology, and data-based policy making are three main opportunities to develop innovative and sustainable policies in forest fire management in Riau Province.

4. DISCUSSION

4.1 Forest fire cases in Riau Province

Figure 1 depicts the percentage of forest fire cases in several provinces in Indonesia in 2023, with South Kalimantan recording the most significant number, namely 38%, followed by Central Java (18%), East Kalimantan (16%), Riau (15%), and West Java (13%) [30]. This distribution shows that forest fires occur more frequently in provinces that have areas with peatlands and tropical forest ecosystems, such as Kalimantan and Sumatra. Apart from geographical factors, the high number of fires in these provinces is also influenced by human activities, such as clearing agricultural land and plantations by burning. Flammable peatlands, especially during the dry season, increase the risk of fires, which can spread quickly and easily. Even though several policies and mitigation efforts have been implemented, forest fires in Indonesia are still a big problem that requires comprehensive handling.

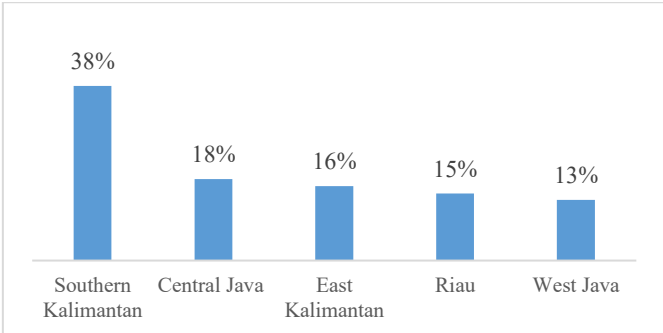

Figure 1. Percentage of the number of cases of forest fire disasters by province in Indonesia 2023

Focusing on Riau Province, which recorded 15% of the total forest fire cases in Indonesia in 2023, shows that this province still faces significant challenges in controlling forest and land fires. Riau has many peatlands that are very vulnerable to fire, especially during the dry season. Even though the Riau Provincial Government has implemented policies such as Regional Regulation Number 1 of 2019 and established a

Forest Fire Control Task Force at every level of government, forest fires still occur frequently, caused mainly by people's habits of clearing land by burning. Government efforts, including involving communities in programs such as Fire Free Villages and Climate Villages, have demonstrated a commitment to reducing fire incidents. However, the challenges are still significant, especially regarding consistent monitoring and implementation of regional policies.

Based on reports from the National Disaster Management Agency (BNPB) in Figure 2, the number of forest fire cases in Riau Province shows marked fluctuations over the last three years [31]. In 2021, BNPB recorded 88 cases of forest fires, which is relatively low compared to previous years. This number even fell to 68 cases in 2022, indicating the impact of forest fire mitigation efforts by the regional government and related agencies, such as the Riau Province Environment and Forestry Service (DLHK). However, in 2023, this figure will increase drastically to 344 cases, underscoring the high risk of forest fires, which remain a significant challenge. These fluctuations reflect that despite efforts to reduce fire incidents, external factors such as climate change, lack of supervision in the field, and illegal land clearing are still the main problems that trigger increased cases.

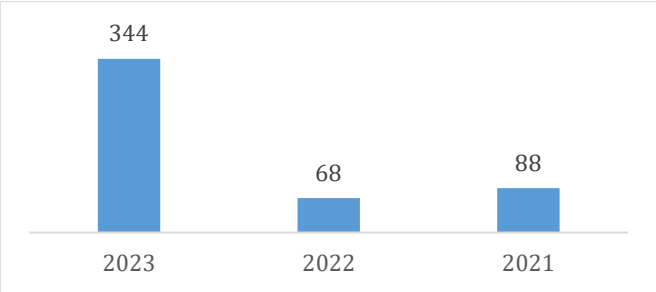

Figure 2. Number of cases of forest fire disasters in Riau Province 2021-2023

The sharp increase in the number of forest fire cases in Riau Province in 2023 signals that the steps taken by related institutions, such as BNPB and the Ministry of Environment and Forestry (KLHK), still face significant challenges in implementation in the field. The decline in cases in 2022 can be seen as a result of the temporary success of prevention policies implemented through tighter supervision and an increased role of field patrols. However, a drastic increase in 2023 shows that external influences, such as climate change causing longer dry seasons, illegal land clearing, and a lack of strict law enforcement against arsonists, have weakened the effectiveness of existing programs. Therefore, it is necessary to strengthen collaboration between agencies, including the TNI-Polri, regional government, and local communities, to integrate prevention efforts, law enforcement, and public education so that similar incidents can be suppressed sustainably.

The Riau Provincial Government has implemented several innovative strategic policies to tackle forest and land fires that often occur, especially during the dry season. One is through Riau Province Regional Regulation Number 1 of 2019, which provides technical guidelines for prevention, post-fire handling, and supervision. In addition, establishing a Forest and/or Land Fire Control Task Force at every level of government, from province to village, is a concrete step to strengthen coordination between agencies and ensure a quick response in handling fire cases [32]. The government has also adopted Peat Water Management Management based on Peat Hydrological Units (KHG) to prevent peatland fires due to drought [33], as well as involving the community through community-based programs [34]. This effort shows the government's commitment to combining technical and participatory approaches to reduce the risk of forest fires.

Apart from policies, the Riau Provincial government also implements several operational measures, such as early detection and monitoring of fire-prone areas using satellite monitoring technology as well as field patrols by a joint team from Manggala Agni, TNI-Polri, and local communities [35]. To increase effectiveness, the government is strengthening fire control synergy through coordination between BPBD, BNPB, and other related institutions. After the fire occurred, the government also focused on rebuilding affected areas and infrastructure. On the other hand, the government is aggressively conducting outreach to the public about the dangers of burning land to clear land, which is the leading cause of fires. These steps show that the government is not only focused on short-term response but is also working to build sustainable solutions to prevent forest fires in the future.

4.2 Political dynamics influence the development of innovative policies for managing forest fires in Riau Province

In Figure 3, the Riau Provincial Government is central in developing policies to overcome forest and land fires (karhutla), considering the profound impact these disasters have on the environment, economy, and public health. One of the strategic policies implemented is Riau Province Regional Regulation Number 1 of 2019, which regulates technical guidelines for preventing, post-fire handling, and monitoring forest and land fires. The regional government also formed a Forest Fire Control Task Force at every level of government, from province to village, to strengthen coordination between agencies and increase preparedness in dealing with potential fires. With this step, the Riau Provincial government ensures a fast and coordinated response to frequent fires, especially during the dry season. In addition, peatland management based on Peat Hydrological Units (KHG) is an integral part of efforts to prevent fires in peatlands that are prone to burning due to drought.

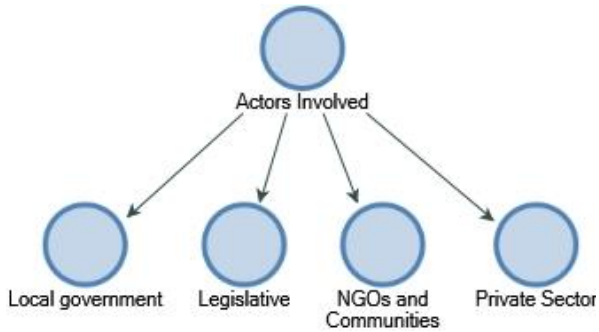

Figure 3. The actors involved influence political dynamics

However, political dynamics also influence the implementation of this policy. As a fire-prone area, Riau often faces challenges regarding adequate budget allocation and policy priorities that can be promoted in each government period. Based on data from the BNPB, it can be seen that there are fluctuations in the amount of budget allocated for forest and land fire management, depending on the political cycle

and decisions taken by local governments. For example, before an election or a change of government, forest fire management policies often experience changes in priorities or budget adjustments that can affect long-term effectiveness. However, with strong political support, innovative policies such as the formation of a Fire Control Task Force and community-based programs are expected to continue to develop and positively impact efforts to control forest fires in Riau Province.

Legislative involvement in decision-making regarding the budget and forest fire management policies in Riau Province involves members of the Regional People's Representative Council (DPRD), who actively participate in budget discussions and policy formulation. Through this process, the DPRD provides valuable input in allocating funds for fire prevention and control programs. They also ensure that the policies taken are relevant to regional needs and can be implemented effectively. However, the involvement of politicians in this policy cannot be separated from the influence of particular political interests, where the continuity of elections and the position of political parties in the region can influence the decisions taken. In this case, politicians can utilize these policies to gain political support from the community, thereby influencing the decision-making process in allocating budgets for fire prevention.

Political dynamism in developing innovative policies for forest fire management in Riau Province involves not only the executive government but also several influential actors at the legislative level. These actors, such as DPRD members, often play a key role in determining policy direction and budget allocation. The influence of politicians with short-term interests, such as gaining voter sympathy during the election period, can accelerate or hinder the implementation of more structured and sustainable policies. In this context, political actors such as governors, regents, and legislative members interact and influence each other, both in terms of strategic policy and in allocating resources. Political interests that drive policy changes can contribute to creating policies more responsive to community needs but also risk creating policies more focused on political gain rather than effective long-term solutions in overcoming forest and land fires in Riau.

Short-term political interests, such as efforts to gain voter sympathy during election periods, often directly impact inefficient and less sustainable budget allocations. Politicians who focus on short-term political gains tend to divert budgets to programs with immediate but unsustainable impacts, such as campaigns that attract public attention quickly, instead of focusing on long-term policies for more effective forest fire mitigation. For example, in 2015, the National Disaster Management Agency (BNPB) allocated IDR 385 billion to handle forest and land fires. However, most funds were used for temporary extinguishing operations, not long-term investments in more permanent fire prevention infrastructure [36].

In addition, in 2017, the Minister of Environment and Forestry revealed that the budget for handling forest fires was only around IDR 500 billion, lower than the previous year's allocation of IDR 680 billion. The Minister stated that the allocated budget was not ideal and that changes were needed to the forest fire handling system to make it more effective [37]. This budget limitation reflects the gap between the desired policy and the realization of the available budget, which is often influenced by short-term political considerations. Thus, this empirical evidence shows that short-term political interests can influence budget allocation in forest fire management, creating a gap between planned policies and the results achieved in the long term.

The involvement of Non-Governmental Organizations (NGOs) that focus on environmental issues plays an important role in developing forest fire management policies in Riau Province. NGOs are often involved in advocacy processes and providing outreach to communities to raise awareness about the dangers of forest fires. In addition, they directly involve the community in fire prevention efforts through several community-based programs, such as Fire Free Villages and Climate Villages. Using a community-based approach, NGOs support the government in educating the public not to burn land carelessly and facilitating collaboration between the government, the private sector, and the community in more sustainable forest fire management.

Collaboration between NGOs and the government has shown positive results in increasing public awareness, especially in areas prone to forest fires. Existing data indicates an increase in outreach campaigns focused on preventing forest fires. These programs have successfully introduced a more holistic approach to mitigation, where communities are empowered to act as monitors and reporters of fires around them. This collaboration also helps strengthen the synergy between government policies and community efforts in preventing fires caused by land-clearing activities by burning.

On the other hand, the private sector, comprised of substantial plantation companies operating in Riau Province, has an equally important role in developing forest fire mitigation policies. Recently, government policies have encouraged the private sector to contribute to fire prevention by providing technology and funds for preventive programs. One prominent example is satellite technology monitoring potential fires in peatlands and plantation areas. Available data shows that these large companies are strongly influenced by pressure from the central government and increasing public awareness of the impact of fires on the environment and social life. Therefore, the private sector is increasingly active in mitigation policies by providing financial and technical support for programs that can prevent forest and land fires in Riau Province.

Political dynamics in Riau Province play a crucial role in the development of innovative policies for forest fire management. The influence of several political actors, such as the provincial government, legislature, and the private sector, creates a policy ecosystem often influenced by short-term political interests. The Riau Provincial Government, through policies and regulations such as Riau Province Regional Regulation Number 1 of 2019 and the formation of a Fire Control Task Force, seeks to provide a fast response to forest fires. However, budget allocations and policy priorities are often influenced by political cycles, such as leading up to elections, which can cause fluctuations in the effectiveness of these policies. Meanwhile, the involvement of the legislature, especially DPRD members, who have a political interest in maintaining their position and gaining voter support, can exacerbate policy instability, creating challenges in designing sustainable and based on scientific evidence. On the other hand, although the private sector is increasingly playing a role in supporting mitigation policies, they are also caught in a political game that sometimes prioritizes short-term economic profits over broader environmental sustainability.

The biggest challenge in this political dynamic is integrating the interests of several actors, including government,

legislature, NGOs, and the private sector, into practical and sustainable policies. Although innovative policies such as community-based campaigns and satellite technology for fire monitoring have been introduced, changing political priorities may impact the continuity of these programs. In this context, the sustainability of forest fire management policies in Riau Province is highly dependent on balancing political interests with the need to protect the environment. Thus, it is important to create a policy framework that is responsive to current political dynamics and proactive in facing long-term challenges, where all actors can work together without being affected by political fluctuations that could hamper joint efforts in fighting forest fires in Riau.

4.3 Opportunities in innovative and sustainable policy development

Although challenges in integrating the interests of several political actors in Riau Province remain, opportunities for developing innovative and sustainable policies remain open. One of the main opportunities is to design policies that can accommodate several interests, such as strengthening collaboration between government, legislature, NGOs, and the private sector, without being affected by short-term political changes. This study also shows the importance of adopting policy models that have been successfully implemented in other countries, where success in managing forest fires is based on collaboration between sectors and a strong commitment to environmental protection. By taking lessons from countries that have successfully implemented fire mitigation policies, Riau Province can formulate policies that are responsive to political dynamics and focus on long-term sustainability, ultimately reducing economic, social, and ecological losses due to forest fires.

In Figure 4, strengthening multi-actor collaboration is a significant opportunity for developing innovative and sustainable policies for managing forest fires in Riau Province. One of the main steps proposed is establishing a collaboration forum between local governments, non-governmental organizations (NGOs), the private sector, and local communities, which aims to improve stakeholder coordination [38]. In this case, each actor will have a more defined role, such as the government being responsible for policy and regulation, NGOs focusing on education and advocacy, and the private sector being able to support through technology and funding [39].

Close collaboration between government, legislature, NGOs, the private sector, and society is essential in producing more holistic policies and integrating several perspectives and existing resources [40]. Community-based programs can be expanded with more substantial support from several parties. In this case, NGOs play an important role in education and outreach to the community, while the private sector can contribute through technology and funding to support fire mitigation initiatives. This broader and more structured collaboration will strengthen responses to forest fires and create more sustainable solutions by involving actors with a long-term interest in environmental sustainability.

Successful examples from other countries, such as Australia, show how strong multi-actor collaboration can produce effective and sustainable forest fire management policies. In Australia, several parties, including state governments, local communities, NGOs, and the private sector, are actively involved in bushfire monitoring, prevention, and disaster management. One successful program uses satellite and drone monitoring technology to detect potential fires early, involving collaboration between governments, universities, and technology companies [41]. This success shows that by integrating several resources and knowledge from several actors, forest fire management policies can become more responsive, coordinated, sustainable, and able to overcome the challenges faced by Riau Province in dealing with similar problems.

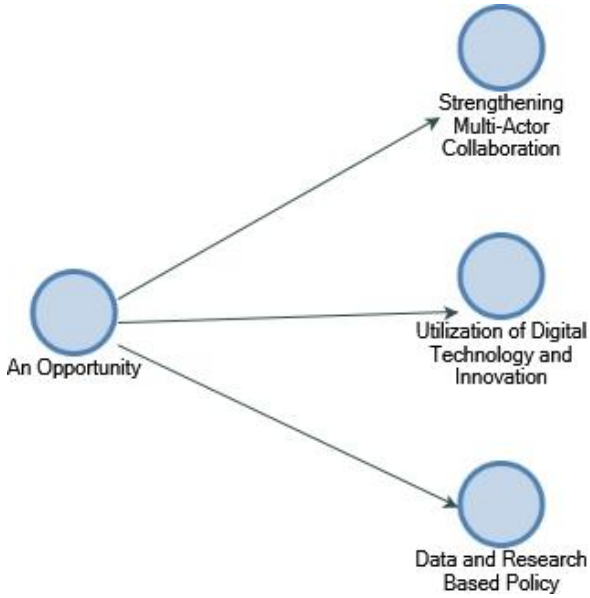

Figure 4. Opportunities in developing innovative and sustainable policies for managing forest fires in Riau Province

Utilizing advanced technology, such as satellite monitoring and real-time data-based mapping systems, provides significant opportunities to identify potential fires earlier and respond more quickly and efficiently. This digital innovation enables more accurate and comprehensive monitoring of the condition of peatlands and forests that are susceptible to fire, as well as speeding up decision-making in managing fires. Using satellite and sensor data, the government and related parties can immediately detect hot spots and intervene early, thereby reducing economic and ecological losses. For example, in California, United States, satellite monitoring technology through the “FIREWISE" program has improved responses to forest fires by identifying hot spots more quickly and supporting mitigation efforts with location-based data that field workers can access in real-time [42, 43]. This success shows how technology can speed up response to fires and help minimize the impact of disasters.

In addition, policies driven by strong data and research have great potential to increase forest fire management’s effectiveness because decisions made based on facts and valid analysis will be more targeted and sustainable [44]. Collecting accurate data on the impact of fires, fire distribution patterns, and community behavior in clearing land will provide a deeper understanding of the factors that cause fires and the most vulnerable areas. This data can also be used to design policies more focused on critical areas and determine the most appropriate interventions. With adequate data, the policies implemented can be more measurable and produce a more significant long-term impact in reducing the incidence of forest fires.

For example, robust data collection and research in Australia have been key to addressing frequent bushfires, mainly through data-based fire risk monitoring and mapping programs. Satellite-based monitoring systems and real-time weather data have allowed authorities to predict fire hotspots and respond more quickly. In addition, in-depth research on human behavior in causing fires and fire patterns triggered by climatic factors has helped design more effective policies [45]. This data-based mitigation program is also supported by collaboration between the government, research institutions, and the community, resulting in more adaptive and sustainable future policies in dealing with forest fires.

In developing innovative and sustainable policies for managing forest fires in Riau Province, it is important to anticipate political dynamics affecting program continuity and implementation. Although data-driven policies, technology, and multi-actor collaboration can offer practical solutions, changing political priorities and differing interests between actors often pose obstacles to implementation. Therefore, a flexible but measurable policy framework is needed to achieve policy sustainability, keeping all relevant actors involved despite political changes. Strengthening the capacity of government and non-government institutions to respond to the challenge of forest fires with an evidence-based approach and more optimal resource management must be the main focus to ensure policies are protected from unwanted changes and remain effective in the long term.

The political dynamics in developing innovative policies for forest fire management in Riau Province require an adaptive and inclusive approach, where several political interests can be accommodated without compromising the long-term goals of environmental protection. To ensure the sustainability of these policies, it is important for all parties—government, legislature, NGOs, the private sector, and society—to maintain commitment to the policies that have been prepared, even though political dynamics may change. In facing changing political priorities, a data-based approach, multi-actor collaboration, and the use of advanced technology must be the main pillars that are not only responsive to current challenges but also able to anticipate potential risks of forest fires in the future. Long-term success in managing forest fires in Riau depends on consistency in policy and synergy between all actors involved.

5. CONCLUSION

The main findings in the political dynamics of developing innovative policies for forest fire management in Riau Province show that interactions between several political actors, such as the provincial government, legislature, NGOs, and the private sector, strongly influence these policies. Even though regional governments have implemented strategic policies such as Regional Regulation Number 1 of 2019 and the formation of a Fire Control Task Force, budget fluctuations and changes in political priorities, especially in the run-up to elections, often affect the effectiveness of these policies. The involvement of the legislature and the private sector also has an impact, both positive in technical and financial support and negatively related to short-term political interests that disrupt program continuity. Therefore, the sustainability of forest fire management policies in Riau depends on balancing political interests with broader environmental protection efforts.

Developing innovative and sustainable policies for managing forest fires in Riau Province can be achieved through strengthening multi-actor collaboration, utilizing advanced technology and strong data-based policies. Collaboration between government, legislature, NGOs, the private sector, and society is important for producing holistic and sustainable policies. Leveraging technology such as satellite monitoring and real-time mapping systems can speed up fire detection and more efficient response, while accurate data-based policies enable more targeted interventions. By integrating these three aspects, Riau can create policies responsive to political dynamics but still focus on long-term sustainability to reduce the impact of forest fires.

ACKNOWLEDGMENT

The authors would like to thank the Universitas Islam Riau for the encouragement to carry out this research with the available funding assistance.

REFERENCES

[1] Adrianto, H.A., Spracklen1, D.V., Arnold, S.R. (2019). Relationship between fire and forest cover loss in Riau Province, Indonesia between 2001 and 2012. Forests, 10(10): 1-19. https://doi.org/10.3390/f10100889

[2] Adni, D.F. (2023). Controlling forest and land fires in Riau Province using collaborative governance: Support for smart environment. E3S Web of Conferences, 440: 02006. https://doi.org/10.1051/e3sconf/202344002006

[3] Adrianto, H.A., Spracklen, D.V., Arnold, S.R., Sitanggang, I.S., Syaufina, L. (2020). Forest and land fires are mainly associated with deforestation in Riau Province, Indonesia. Remote Sensing, 12(1): 1-12. https://doi.org/10.3390/RS12010003

[4] Saputra, E. (2019). Beyond fires and deforestation: Tackling land subsidence in peatland areas, a case study from Riau, Indonesia. Land, 8(5): 11-13. https://doi.org/10.3390/land8050076

[5] Karya, D., Hasan, H., Kadir, E.A. (2017). Impact of forest fire to economic and environment in Riau Province Indonesia. International Business Management, 11(2): 474-477.

[6] Kusumaningtyas, S.D.A., Aldrian, E. (2016). Impact of the June 2013 Riau Province Sumatera smoke haze event on regional air pollution. Environmental Research Letters, 11(7): 075007. https://doi.org/10.1088/1748-9326/11/7/075007

[7] Helmi, H., Djafri, D., Mutiani, C., Halim, N.A., Badri, M., Yefni, Y. (2021). Indigenous people in the dynamics of land use changes, forest fires, and haze in Riau Province, Indonesia. Natural Resource Governance in Asia: From Collective Action to Resilience Thinking, pp. 291-308. https://doi.org/10.1016/B978-0-323-85729-1.00023-2

[8] Taufik, M., Haikal, M., Widyastuti, M.T., Arif, C., Santikayasa, I.P. (2023). The impact of rewetting peatland on fire hazard in Riau, Indonesia. Sustainability, 15(3): 2169. https://doi.org/10.3390/su15032169

[9] Stephens, S.L., Ruth, L.W. (2005). Federal forest-fire policy in the United States. Ecological Applications, 15(2): 532-542. https://doi.org/10.1890/04-0545

[10] Sengdara, K., Sukendro, A., Heridadi. (2023). The role

of the government of Riau Provincial in dealing with forest and land fires. IOP Conference Series: Earth and Environmental Science, 1173(1): 12063. https://doi.org/10.1088/1755-1315/1173/1/012063
[11] Rodríguez-Teijeiro, A., & Román-Masedo, L. (2023). The role of media in risk management processes—Analysis of the news coverage of the forest fires in Spain. Social Sciences, 12(12): 12120688. https://doi.org/10.3390/socsci12120688
[12] Purnomo, E.P., Ramdani, R., Agustiyara, Nurmandi, A., Trisnawati, D.W., Fathani, A.T. (2021). Bureaucratic inertia in dealing with annual forest fires in Indonesia. International Journal of Wildland Fire, 30(10): 733-744. https://doi.org/10.1071/WF20168
[13] Roengtam, S., Agustiyara, A. (2022). Collaborative governance for forest land use policy implementation and development. Cogent Social Sciences, 8(1): 2073670. https://doi.org/10.1080/23311886.2022.2073670
[14] Christiawan, R. (2020). Dealing with land and forest fires through improvement of regulations. IOP Conference Series: Earth and Environmental Science, 504(1): 12018. https://doi.org/10.1088/1755-1315/504/1/012018
[15] Van Hoang, T., Chou, T.Y., Fang, Y.M., Nguyen, N.T., Nguyen, Q.H., Canh, P.X., Ngo Bao Toan, D., Nguyen, X.L., Meadows, M.E. (2020). Mapping forest fire risk and development of early warning system for NW vietnam using AHP and MCA/GIS methods. Applied Sciences, 10(12): 10124348. https://doi.org/10.3390/app10124348
[16] Hefty, K.L., Gillan, J.K., Trejo, J., Koprowski, J.L. (2024). Effectiveness of pre-fire forest management on post-fire forest conditions in southeastern Arizona. Fire Ecology, 20(1): 42408. https://doi.org/10.1186/s42408-024-00318-3
[17] Tang, J., Weeramongkolkul, M., Suwankesawong, S., Saengtabtim, K., Leelawat, N., Wongwailikhit, K. (2024). Toward a more resilient Thailand: Developing a machine learning-powered forest fire warning system. Heliyon, 10(13): 34021. https://doi.org/10.1016/j.heliyon.2024.e34021
[18] Su, H.Y., Wang, X.Y., Chen, W., Ding, N., Cui, X.L., Bai, M.Q., Chen, Z.L., Li, M.S. (2024). A novel framework for identifying causes of forest fire events using environmental and temporal characteristics of the ignition point in fire footprint. Ecological Indicators, 160: 111899. https://doi.org/10.1016/j.ecolind.2024.111899
[19] Kalogiannidis, S., Chatzitheodoridis, F., Kalfas, D., Patitsa, C., Papagrigoriou, A. (2023). Socio-psychological, economic and environmental effects of forest fires. Fire, 6(7): 6070280. https://doi.org/10.3390/fire6070280
[20] Thamruksa, P., Muneenam, U. (2025). Difficulties to be overcome by the peat swamp forest fire management in Nakhon Si Thammarat Province, Thailand. GMSARN International Journal, 19(1): 1-9.
[21] Lucas, F.M.F., Araujo, E.C.G., Fiedler, N.C., Santana, J.A. da S., Tetto, A.F. (2023). Scientific gaps on forest fires in Brazilian protected areas. Forest Ecology and Management, 529: 120739. https://doi.org/10.1016/j.foreco.2022.120739
[22] Eloy, L., Hecht, S., Steward, A., Mistry, J. (2019). Firing up: Policy, politics and polemics under new and old burning regimes. Geographical Journal, 185(1): 2-9. https://doi.org/10.1111/geoj.12293
[23] Undurraga, T., Güell, P., Fergnani, M. (2022). 'Supertanker is a hero, the government a Villain': Politicization of Chile's 2017 forest fires in the media. Cultural Sociology, 16(4): 527-547. https://doi.org/10.1177/17499755211067642
[24] Joseph, G.S., Seymour, C.L., Rakotoarivelo, A.R. (2024). Fire incongruities can explain widespread landscape degradation in Madagascar's forests and grasslands. Plants People Planet, 6(3): 656-669. https://doi.org/10.1002/ppp3.10471
[25] Wilson, P.I., Paveglio, T., Becker, D. (2018). The politically possible and wildland fire research. Fire, 1(1): 1-6. https://doi.org/10.3390/fire1010012
[26] Purnomo, H., Shantiko, B., Sitorus, S., Gunawan, H., Achdiawan, R., Kartodihardjo, H., Dewayani, A.A. (2017). Fire economy and actor network of forest and land fires in Indonesia. Forest Policy and Economics, 78: 21-31. https://doi.org/10.1016/j.forpol.2017.01.001
[27] Ali, A., Alsulaiman, F.A., Irshad, K., Shafiullah, M., Malik, S.A., Memon, A.H. (2021). Renewable portfolio standard from the perspective of policy network theory for Saudi Arabia Vision 2030 targets. 2021 4th International Conference on Energy Conservation and Efficiency, 1-5. https://doi.org/10.1109/ICECE51984.2021.9406286
[28] Nurkaidah, Anas, A., Baharuddin, T. (2024). Implementation of environmental policies on the development of a new capital city in Indonesia. Cogent Social Sciences, 10(1): 2297764. https://doi.org/10.1080/23311886.2023.2297764
[29] Karinda, K., Baharuddin, T. (2024). Climate change policy based on global study evolution 1979-2023: An insight and direction for Indonesia. IOP Conference Series: Earth and Environmental Science, 1388: 012054. https://doi.org/10.1088/1755-1315/1388/1/012054
[30] BPS. (2023). Jumlah Kejadian Bencana Alam Menurut Provinsi. https://www.bps.go.id/id/statistics-table/3/TUZaMGVteFVjSEJ4T1RCMlIyRjRTazVvVDJocVFUMDkjMw==/jumlah-kejadian-bencana-alam-menurut-provinsi--2022.html?year=2022.
[31] BPS. (2024). Jumlah Kejadian Bencana Alam Menurut Kabupaten/Kota di Provinsi Riau, 2023. https://riau.bps.go.id/id/statistics-table/3/TUZaMGVteFVjSEJ4T1RCMlIyRjRTazVvVDJocVFUMDkjMw==/jumlah-kejadian-bencana-alam-menurut-kabupaten-kota-di-provinsi-riau--2023.html?year=2023.
[32] LHK. (2019). Peraturan Daerah Provinsi Riau Nomor 1 Tahun 2019 Tentang Pedoman Teknis Penanggulangan Kebakran Hutan dan Lahan. https://peraturan.bpk.go.id/Details/167158/perda-prov-riau-no-1-tahun-2019.
[33] Yusuf, A., Hapsoh, H., Siregar, S.H., Nurrochmat, D.R. (2019). Analisis kebakaran hutan dan lahan di provinsi riau. Dinamika Lingkungan Indonesia, 6(2): 67-84. https://doi.org/10.31258/dli.6.2.p.67-84
[34] Arifudin, Nasrul, B., Maswadi. (2013). Program of community empowerment prevents forest fires in Indonesian Peat Land. Procedia Environmental Sciences, 17: 129-134. https://doi.org/10.1016/j.proenv.2013.02.020
[35] Gunadi, A., Gunardi, G., Martono, M. (2019). The law of

forest in Indonesia: Prevention and suppression of forest fires. Bina Hukum Lingkungan, 4(1): 113. https://doi.org/10.24970/bhl.v4i1.86

[36] Aminah, A.N. (2015). Sudah Rp 385 Miliar Anggaran Habis untuk Tangani Kebakaran Hutan. https://news.republika.co.id/berita/nasional/umum/15/10/11/nw1xi5384-sudah-rp-385-miliar-anggaran-habis-untuk-tangani-kebakaran-hutan.

[37] BBKSDA Jatim. (2016). Anggaran Kebakaran Hutan 2017 Masih Minim. https://bbksdajatim.org/anggaran-kebakaran-hutan-2017-masih-minim/.

[38] Adni, D.F., Zubaidah, E., Baharuddin, T. (2024). Agile governance: The urgency of handling forest and land fires in Riau Province. Jurnal Manajemen Pelayanan Publik, 8(2): 490-505. https://doi.org/10.24198/jmpp.v8i2.53161

[39] Ibrahim, A.H.H., Baharuddin, T., Wance, M. (2023). Developing a forest city in a new capital city: A thematic analysis of the Indonesian government's plans. Jurnal Bina Praja, 15(1): 1-13. https://doi.org/https://doi.org/10.21787/jbp.15.2023.1-13

[40] Adni, D.F., Nurmandi, A., Mutiarin, D. (2024). The influence of culture on the implementation of collaborative governance: The study of forest and land fires control organization. Journal of Governance and Regulation, 1(1): 322-332. https://doi.org/10.22495/jgrv13i1siart6

[41] Jackson, W., Freeman, M., Freeman, B., Parry-Husbands, H. (2021). Reshaping forest management in Australia to provide nature-based solutions to global challenges. Australian Forestry, 84(2): 50-58. https://doi.org/10.1080/00049158.2021.1894383

[42] Kampfschulte, A.R., Miller, R.K. (2023). Regional participation trends for community wildfire preparedness program Firewise USA. Environmental Research: Climate, 2(3): 035013. https://doi.org/10.1088/2752-5295/ace4e9

[43] Nagano, S.M. (2020). The price is light: Socializing the cost of wildfires in California. Environmental Claims Journal, 32(3): 179-200. https://doi.org/10.1080/10406026.2019.1706895

[44] Son, M.W., Kim, C.G., Kim, B.S. (2024). Development of an algorithm for assessing the scope of large forest fire using VIIRS-based data and machine learning. Remote Sensing, 16(14): 16142667. https://doi.org/10.3390/rs16142667

[45] Baker, G., Webb, A., Whiting, P. (2020). Regulatory controls for buildings in wildfire-prone areas of Australia. Fire Technology, 56(5): 1903-1935. https://doi.org/10.1007/s10694-020-00999-7