

Agile Governance: The Urgency of Handling Forest and Land Fires in Riau Province

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Agile Governance: The Urgency of Handling Forest and Land Fires in Riau Province

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ABSTRAK

Ancaman serius yang ditimbulkan oleh kebakaran hutan atau lahan di Provinsi Riau, dengan dampak ekologis, sosial, dan ekonomi yang signifikan, menjadi fokus penelitian ini. Penelitian ini bertujuan untuk mengidentifikasi urgensi terkait masalah kebakaran di Provinsi Riau, menganalisis faktor-faktor yang mendukung dan menghambat penanganan kebakaran, serta menyusun rekomendasi kebijakan guna meningkatkan upaya mitigasi. Proses analisis data dalam penelitian ini mengandalkan platform Nvivo 12 Plus, memungkinkan pengumpulan, penyajian, dan pengolahan data kualitatif dengan lebih efisien. Hasil penelitian menunjukkan beberapa faktor yang mendukung implementasi tata kelola agile, termasuk keterlibatan aktif pemangku kepentingan, penggunaan teknologi yang memadai, dan pengembangan Sistem Informasi Geografis (SIG) terintegrasi. Namun, ditemukan faktor-faktor penghambat seperti kurangnya sumber daya dan resistensi terhadap perubahan. Rekomendasi kebijakan yang diajukan meliputi penguatan keterlibatan pemangku kepentingan melalui forum kolaboratif, peningkatan infrastruktur teknologi, peningkatan kesadaran masyarakat, pengembangan protokol respons cepat, pemantauan dan evaluasi secara teratur, penguatan hukum dan penegakan hukum, serta promosi kerja sama antar-wilayah dan antar-lembaga. Urgensinya terletak pada perlunya tindakan segera untuk melindungi lingkungan, kesehatan masyarakat, dan ekonomi regional dari dampak negatif kebakaran hutan dan lahan.

ABSTRACT

The research focuses on the serious threat that land or forest fires pose to Riau Province, with their profound effects on the environment, society, and economy. This research aims to identify urgent interests related to fire problems in Riau Province, analyze factors that support and hinder fire management, and develop policy recommendations to improve mitigation efforts. The data analysis process in this research relies on the Nvivo 12 Plus platform, allowing for more efficient collection, presentation and processing of qualitative data. The research results show several factors that support the implementation of agile governance, including active stakeholder involvement, adequate use of technology, and development of an integrated Geographic Information System (GIS). However, inhibiting factors were found, such as lack of resources and resistance to change. The proposed policy recommendations include strengthening stakeholder involvement through collaborative forums, improving technological infrastructure, increasing public awareness, developing rapid response protocols, regular monitoring and evaluation, strengthening laws and law enforcement, and promoting inter-regional and inter-institutional cooperation. The urgency reflects the necessity of responding promptly to prevent the damaging effects of forest and land fires on the environment, public health, and local economy.

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INTRODUCTION

There are significant negative effects from land and forest fires (Paudel, 2021). Negative effects of forest and land fires include harm to the ecosystem, greenhouse gas emissions, air pollution, economic losses, and social conflict (Dinc et al., 2021). These fires damage valuable ecosystems, release emissions, pollute the air, cause economic and social losses, and trigger conflicts between various stakeholders (Hylander et al., 2022; Sannigrahi et al., 2022; Taylor & Lindenmayer, 2020). Therefore, severe and holistic treatment is needed to prevent, control and rehabilitate land affected by forest and land fires to minimize their adverse impacts and protect natural resources and community welfare (Alayan et al., 2022). Cases of forest and land fires also often occur in several regions in Indonesia (Purnomo et al., 2021), especially in Riau Province (Fitriany et al., 2021). The Regional Disaster Management Agency reported that since January 2021, cases of forest and land fires covering an area of 657 hectares were found in Riau Province (Anggoro & Maryati, 2021). This shows the urgency of seriously handling this case.

Land fires in Riau Province show the urgency of serious handling because of their damaging impact on the environment and human health. According to a report by the Regional Disaster Management Agency, since January 2021, there have been cases of forest and land fires that have covered an area of 657 hectares (Anggoro & Maryati, 2021). During the period 1 January to 10 July 2023, forest and land fires in Riau Province also spread to more than 818 hectares, as reported by the provincial government (Frislidia & Maryati, 2023). The affected areas include Bengkalis (337.48 ha), Dumai (100.57 ha), Indragiri Hilir (47.57 ha), Indragiri Hulu (24.80 ha), Kampar (46.99 ha), Meranti (12, 75 ha), Kuantan Singingi (2 ha), Pelalawan (37.18 ha), Rokan Hilir (135.5 ha), Rokan Hulu (35.5 ha), Siak (22.35 ha), and Pekanbaru (18, 5 ha). This data confirms the serious escalation of the problem of land fires in the region, requiring greater and more coordinated efforts to handle and prevent them to protect the affected ecosystems and communities.

This fire case requires a serious response and an active role from the government. The government is mainly responsible for coordinating prevention, control and rehabilitation efforts related to forest and land fires (Brotstes Panjaitan et al., 2019). Concrete steps are needed, such as strict law enforcement against illegal burning practices, increasing patrols and monitoring of land vulnerable to fire, and developing an effective early detection system (Watts et al., 2019). Apart from that, the government can also strengthen coordination between related institutions (Abatzoglou et al., 2021), increase human resource capacity and fire fighting infrastructure (Roldán-Gómez et al., 2021), and prioritize public education and awareness about preserving forests and land (Soe & Yeo-Chang, 2019). Through a severe handling response and an active role from the government, it is hoped that forest and land fires can be suppressed and handled more effectively, protecting the environment and maintaining the sustainability of natural resources.

In addition, alternative strategies are required, and agile governance is one of them. This strategy acknowledges that more flexibility is needed in complex and dynamic contexts (Nurrochmat et al., 2021). Agile governance aims to create a more innovative, collaborative and effective environment in facing complex and changing challenges (Soundararajan et al., 2021). The agile governance approach can have several relevant implications in forest and land fires. First, because forest and land fires are a complex problem involving multiple stakeholders, this approach allows for closer collaboration between government, communities, law enforcement agencies and the private sector. Second, the agile governance approach allows for faster and

more adaptive decision-making¹ in dealing with forest and land fires. In rapidly changing conditions, quick and appropriate action is essential to extinguish fires quickly.

Agile governance¹ is very important in handling forest and land fires because it provides the flexibility and adaptability needed to deal with complex and changing conditions. In the context of Riau, where challenges such as unpredictable weather conditions and illegal land-burning activities are contributing factors, the agile governance approach allows for more efficient coordination between various stakeholders, including government, communities, and the private sector. Previous literature, as mentioned by Nurrochmat and Soundararajan, has highlighted the importance of agile governance approaches in disaster contexts, emphasizing innovation, collaboration, and effectiveness as key to facing complex challenges. Therefore, in the context of Riau, the implementation of agile governance is urgent to increase fast and adaptive responses in handling and realizing efforts to protect the environment and sustain natural resources.

Agile governance is an approach to governance that emphasizes flexibility, adaptability and responsiveness in the face of rapid change. This concept adopts the principles and practices of agile methodology, which are generally used in software development and applies them in the decision-making and management of organizations or projects (Mergel et al., 2021). In this approach, decision-making is carried out iteratively and incrementally, emphasizing continuously developing understanding of changing situations and needs (Janssen & van der Voort, 2020). The goal is to achieve agility and speed in decision-making, face inevitable change, and achieve more adaptive and effective results (Holbeche, 2019). Agile governance offers a more responsive, innovative and collaborative approach to managing an organization or project, enabling rapid adaptation and adjustment in the face of complexity and uncertainty.

In handling disasters related to land fires in Riau, key actors¹ such as the regional government, the Regional Disaster Management Agency (BPBD), the Peat Restoration Agency (BRG), the police, and the community play an important role in mitigation and response efforts. However, problems such as lack of coordination between agencies, low capacity for early detection, and weak law enforcement against illegal land burning practices present serious challenges. So far, the governance that has been implemented tends to be centralized and less responsive to rapid changes and the complexity of problems (Adni, 2023). Therefore, an agile governance approach that emphasizes flexibility, adaptability, and responsiveness is very necessary. With this approach, it is hoped that the government and related institutions can be more efficient in responding to changes in the situation and improve coordination between stakeholders to achieve more effective results in handling land fires in Riau.

The application of agile governance in dealing with forest and land fires iteratively and incrementally (Bourgoin et al., 2020). This means that countermeasures are carried out in stages and can be adjusted as the situation changes. In addition, actively involved stakeholders can provide input and involve themselves in decision-making. Close collaboration increases community involvement and enables more effective fire management (Cheng & Dale, 2020). In fire management, agile governance also allows continuous evaluation of the effectiveness of the steps taken. Through repeated planning, implementation, and evaluation cycles, governments and stakeholders can improve their actions based on growing experience and understanding. Applying agile governance in fire management brings an adaptive, responsive and collaborative approach. Through close collaboration between stakeholders, rapid decision-making, and continuous evaluation, fire management can be carried out more effectively in the face of the complexity and uncertainty associated with forest and land fires.

Literature Review

Controlling forest and land fires is important to preserve the environment and reduce negative impacts on ecosystems and humans (Al Abri et al., 2023; Diendéré & Kaboré, 2023). In general, controlling forest and land fires involves a series of proactive and reactive steps. Proactive steps include prevention efforts such as fire monitoring, law enforcement against activities that have the potential to trigger fires, and public education about safe practices in land management. On the other hand, reactive steps involve a quick response to a fire that has already occurred, such as mobilizing a firefighting team, using fire extinguishers, and coordinating with various related parties to limit and extinguish the fire (Mashur et al., 2024; Thompson et al., 2022; Turco et al., 2023).

The greatest obstacle in managing forest and land fires is the complexity of the components that contribute to the fire, including harsh weather, humidity, vegetation, and human activity (Courtney Mustaphi et al., 2023; Rodriguez-Jimenez et al., 2023). Climate change has also increased the frequency and intensity of forest and land fires in many regions (Malik et al., 2023). In addition, resource management and inter-agency coordination constraints often become obstacles in fire control efforts. Therefore, a holistic and collaborative approach involving government, society, and the private sector is needed to increase effectiveness in mitigating fire cases and mitigating risks (Adni, 2023). One approach being considered is agile governance (Thompson et al., 2022).

Agile governance refers to a management approach that is responsive, flexible, and adaptive to change in a complex and dynamic environment. In general, agile methodology is based on cross-functional team collaboration, rapid iteration, and data-driven decision-making to achieve better results in projects and risk management (Gajendran & Oloruntoba, 2017; Hanida et al., 2021; Thompson et al., 2022). In the context of controlling forest and land fires, applying agile governance principles can help increase the effectiveness of responses to fires. The application of agile governance in mitigating fire cases also allows for more adaptive decision-making and responsiveness to environmental dynamics and changing needs. With a focus on flexibility, transparency and continuous learning, an agile approach can help improve preparedness and effectiveness in addressing the increasingly complex and often unpredictable challenges of forest and land fires.

Many studies have been conducted on land fire and forest fire incidents, with a focus on the province of Riau. However, very few specific and simultaneous research results are found in studying these problems using an agile governance approach. However, several previous research results are still considered relevant to support this research. First, forest and land fires damage and burn large areas of forest, vegetation and land, which can occur naturally or be caused by humans (Cochrane & Barber, 2009). Second, controlling forest and land fires is very important to maintain ecosystem sustainability, protect human life, and reduce environmental negative impacts (Stephens et al., 2020). Third, agile governance has become the focus of research by many global researchers to overcome the problem of forest and land fires (Souby & Khatun, 2019). The agile governance offers a relevant framework for dealing with the complex and rapidly changing challenges associated with forest and land fires.

This research aims to analyze the urgency of controlling forest and land fires in Riau Province using an agile governance approach. This research aims to understand the effectiveness of implementing an agile governance approach in dealing with forest and land fires in the region and to evaluate the extent to which collaboration, adaptability and responsiveness in decision-making have been implemented. The research questions include: a) How is the agile governance approach implemented in mitigating fire cases in Riau Province? b) What factors support or hinder the implementation of the agile governance approach in mitigating fire cases in Riau Province? c) Recommendations for policies needed in the future. This research can provide a deeper understanding of the urgency and potential of the agile governance approach in overcoming the problem of forest and land fires in Riau Province.

RESEARCH METHODS

This research method adopts a qualitative approach, with the data collection process involving interviews, observation and document analysis. Interviews were conducted by considering the selection of informants who were considered relevant and related to the research formulation or questions. The Regional Disaster Management Agency (BPBD) of Riau Province, the Forestry Service of Riau Province, and the Regional Government of Riau Province were the parties interviewed in the context of this research. Observations were carried out by directly visiting the locations of forest and land fires, including several other areas affected by the fires. Documentation is required for data collection in the form of relevant documents, such as reports, scientific literature, and other related information. The data analysis process in this research uses Nvivo 12 Plus software, which allows collecting, presenting, and processing qualitative data more efficiently. Data from interviews, observations and documents that have been collected are imported into Nvivo 12 Plus for data reduction.

Data reduction involves coding the data, where key concepts and patterns of findings are identified and categorized. Next, the data is studied in depth to identify patterns, trends and relationships between the information contained in the data. Data validation in this research was carried out through triangulation of research data. Data triangulation is a method that involves using several different data sources or research approaches to verify findings and ensure the reliability of research results. In this context, data obtained from interviews, observations, and documentation are used to compare and validate the findings found during the analysis. Research results that have been processed using Nvivo 12 Plus and have passed the data triangulation validation process are used to answer research questions and develop relevant findings. With this approach, this research can provide more robust and more convincing results that can be used to identify factors that influence the management of forest and land fires in Riau Province and develop better policy recommendations to overcome this problem.

RESULTS AND DISCUSSIONS

Agile Governance: Managing Forest and Land Fire Cases in Riau Province

Riau Province, located on the Indonesian island of Sumatra, has long been one of the areas vulnerable to destructive forest fires. Land fires in Riau Province show a serious escalation of this problem, with the affected area reaching 657 hectares since January 2021 and expanding to more than 818 hectares during the period January to July 2023 (Anggoro & Maryati, 2021; Frislidia & Maryati, 2023). This fire case had a far-reaching impact, including environmental damage, threats to public health, and significant economic impacts. In recent decades, forest

fires in this region have been in the international spotlight due to the resulting air pollution and greenhouse gas emissions.

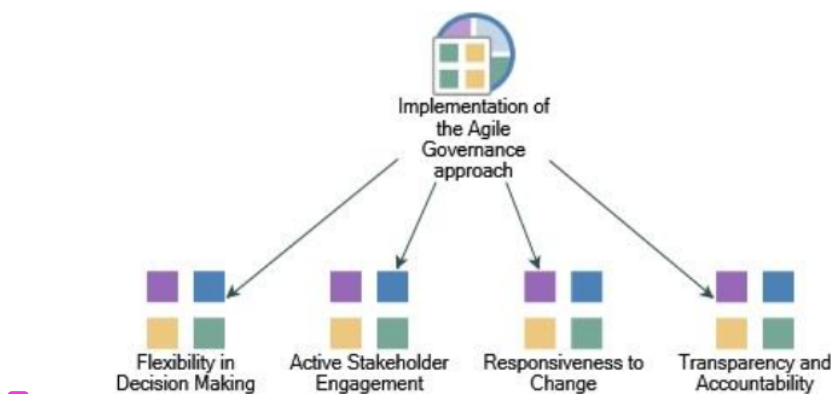
Figure 1.
Sample of Forest Fire Cases in Riau Province



Source: Accessed by the author from riau.go.id (2023)

Cases of fires in forests or land have become an increasingly urgent polemic in Riau Province, Indonesia. Implementing innovative and adaptive approaches in mitigating fire cases is very important to overcome this challenge. One approach that has emerged as a potential solution is agile governance. Agile Governance adopts the principles of flexibility, responsiveness and active involvement of various related parties in the decision-making process and implementing actions. This approach has been successfully applied in various contexts, including information technology, project management and business. However, how agile governance can be implemented effectively in the context of forest-land fires in Riau Province is a question that requires further exploration. This study maps how this concept is applied in the case of controlling forest-land fires in Riau Province.

Figure 2.
Benefits of Implementing an Agile Governance Approach in Mitigating Forest and Land Fires in Riau Province



Source: Captured From Nvivo 12 by Researcher (2023)

Applying the agile governance approach in mitigating forest-land fires in Riau Province brings several significant benefits. First, flexibility in decision-making proves pivotal when addressing forest fires, which frequently elude precise prediction. In this approach, governments and related institutions can quickly respond to changing situations and adapt their strategies. For example, if a change in weather could affect the spread of fire, decisions can be changed efficiently to deal with it. Additionally, the active involvement of stakeholders is another important factor. Various parties, such as local governments, environmental institutions, local communities, and the private sector, have different roles in mitigating fire cases. Agile Governance encourages strong collaboration and cooperation between them. For example, environmental agencies can provide knowledge about forest conservation, while local communities can provide important information about emerging fires' locations. This helps optimize available resources and efforts.

The agile governance approach described has great potential to effectively address the problem of forest fires. Flexibility in decision-making allows for rapid response to changing situations, such as changes in weather that can affect the spread of fire. In addition, the active involvement of stakeholders through strong collaboration enables the optimization of resources and efforts in fire mitigation. By implementing agile governance, it is hoped that forest fire management will become more adaptive, responsive, and effective. However, this positive impact needs to be balanced with careful monitoring of its implementation, because there are potential risks such as abuse of power, lack of accountability, and imbalance of interests between various stakeholders. Therefore, it is important to continuously evaluate the implementation of agile governance to ensure that the positive impacts outweigh the risks.

Responsiveness to change is the essence of agile governance, which is very relevant in handling forest fires. Fires can develop dramatically in a short period. With an adaptive approach, action can be taken more quickly and effectively to control fires. Additionally, monitoring and evaluating each step taken allows for continuous learning, which can be applied to subsequent responses. Additionally, transparency and accountability are fundamental principles of agile governance. In the context of fire control, this means that decision-making and implementation of actions must be accountable. This gives confidence to the community that the actions taken are in the best interests of all. Additionally, transparency allows for external monitoring and independent evaluation of fire control efforts, which can help identify areas requiring improvement.

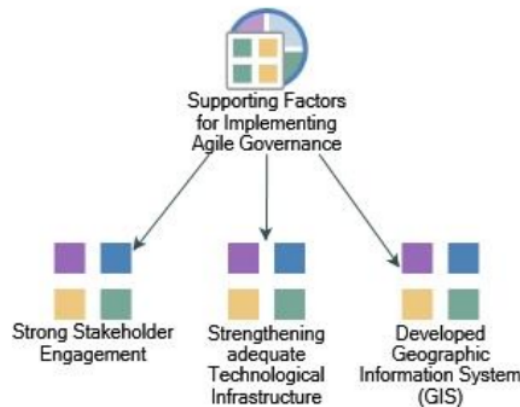
Applying the agile governance approach in mitigating fire cases has significant implications. By increasing flexibility in decision-making, active involvement of stakeholders, responsiveness to change, and transparency and accountability, Riau Province can expect significant improvements in their ability to address the threat of forest and land fires. This means that fire management becomes more adaptive, efficient and effective. Additionally, more robust engagement from various parties, such as local communities, environmental institutions, and the private sector, allows for broader collaboration and a better understanding of the issue. Enhanced responsiveness to changes in weather and environmental situations allows for more timely prevention and response measures. Meanwhile, transparency and accountability will build public trust in fire control efforts, while external monitoring will help identify and improve weaknesses in the existing control system. Thus, applying agile governance can potentially reduce the impact of forest and land fires detrimental to Riau Province and improve environmental sustainability and community welfare.

Factors That Support or Hinder the Implementation of an Agile Governance Approach

Although the agile governance approach has many potential benefits in mitigating fire cases, several factors can influence the success or failure of its implementation. It is essential to understand these factors because they can help identify challenges and opportunities in implementing this approach effectively. In an often complex and changing context, such as controlling forest and land fires, recognizing the factors that support or hinder the implementation of agile governance is an essential first step to improving mitigation and response efforts.

This study maps several factors that support the implementation of agile governance, including the following:

Figure 3.
Factors That Support the Implementation of Agile Governance



Source: Captured From Nvivo 12 by Researcher (2023)

The crucial aspect of effectively implementing agile governance lies in the robust engagement of stakeholders. This encompasses cooperative efforts from regional governments, environmental institutions, local communities, and private enterprises. A tangible illustration of such involvement is the partnership between the Ministry of Environment and Forestry (KLHK) and the Agency for the Assessment and Application of Technology (BPPT) in utilizing Weather Modification Technology (TMC). Through this collaboration, KLHK gains insights into the complexities of forest and land fires, while BPPT furnishes cutting-edge weather technology to forecast and manage weather fluctuations impacting fire propagation. This exemplifies how active stakeholder participation and interdisciplinary collaboration bolster the application of agile governance in addressing forest and land fires.

Apart from that, the government has also adopted an approach to strengthening adequate technological infrastructure. This is considered very important in handling forest-land fire cases in several studies. This includes real-time weather monitoring systems, the use of geospatial data, and other technologies. A concrete example is weather sensors and satellite monitoring to detect hot spots or potentially burning areas. This real-time data can help in planning and responding quickly to fires. Using drones and UAV (Unmanned Aerial Vehicle) devices is also essential to the technological infrastructure for monitoring forest and land fires (Sudhakar et al.,

2020). With adequate technological infrastructure, the necessary information can be collected and analyzed efficiently for informed decision-making.

An integrated Geographic Information System (GIS) built on spatial data is another supporting element which has been studied in the case of forest fires. GIS enables the mapping of fire-prone areas, monitoring environmental changes, and efficient resource allocation (Kanga et al., 2017; Ozenen Kavlak et al., 2021). An example of implementation is using GIS to map areas with high fire risk. This spatial data can help governments and institutions design more effective fire prevention and extinguishing strategies. In addition, GIS can also be used to identify areas that require further attention in fire monitoring and mitigation.

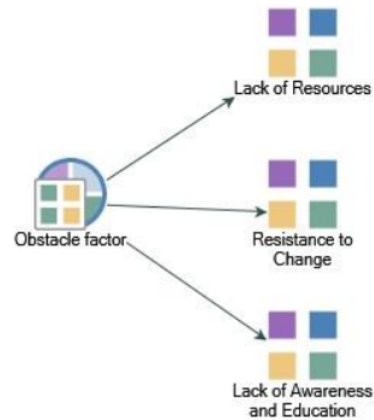
With the active involvement of stakeholders, adequate technological infrastructure, and the development of sophisticated GIS, Riau Province can maximize the implementation of the agile governance approach in handling forest-land fire cases. This will enable a faster and more efficient response to fire threats using technology that enables better weather monitoring, data analysis and mapping. These are essential steps to improve Riau Province's ability to protect the environment and communities from the negative impacts of forest and land fires. Under these conditions, Riau Province has excellent potential to increase effectiveness in handling forest-land fire cases, with a faster and more precise response, thanks to the active involvement of stakeholders, adequate technological infrastructure, and sophisticated GIS. This is expected to contribute significantly to environmental protection and community safety from the severe impacts of fires in the future.

The agile governance approach applied to control forest and land fires (Karhutla) has had a positive impact. However, it has yet to reach its maximum potential. This is reflected in the significant reduction in the area of forest and land fires in 2021 compared to the previous year. In 2020, Riau Province faced severe challenges, with the forest and land fire area reaching 1,600.41 hectares. However, through implementing a more adaptive and responsive approach such as agile governance, 2021 recorded a significant decline, with the area of forest and land fires decreasing to 1,400.08 hectares. This means a decrease of around 200.33 hectares or around 12.09% (Heru, 2021).

Although this reduction may not have reached the desired target, it is a positive indication that a more flexible and collaborative approach to controlling forest and land fires has brought encouraging results. With the active involvement of stakeholders, the use of more sophisticated technology, and increased awareness of the importance of monitoring and rapid response to forest and land fires, Riau Province can continue to take positive steps in reducing the risk and impact of forest and land fires in the future. With better cooperation and continued efforts, we hope to see a more significant reduction in forest and land fires and more effective environmental protection.

Apart from the supporting factors described above, this study also mapped several inhibiting factors, including the following:

Figure 4.
Factors That Inhibit the Implementation of Agile Governance



² Source: Captured From Nvivo 12 by Researcher (2023)

One of the significant obstacles to implementing the agile governance approach in handling forest-land fire cases is the need for more resources. In this context, resources include trained personnel, a sufficient budget, and adequate equipment. Fire control requires the active role of various parties, including firefighters, data analysts and technology technicians. A lack of trained personnel can hinder responding to fires quickly and efficiently. In addition, adequate budget allocation for weather monitoring, firefighting equipment, and technology infrastructure is essential in successfully implementing agile governance. In the case of forest and land fires, more resources can be needed to slow down response efforts and reduce the effectiveness of the response.

Resistance to change can be a severe obstacle when implementing a new approach such as agile governance. Especially in environments that are accustomed to traditional fire control methods, some may resist accepting more adaptive approaches. Communities or institutions unwilling to change may maintain old practices that may not be effective in dealing with fires. This resistance can arise due to uncertainty or discomfort associated with change or a lack of understanding of the benefits that agile governance may provide. Therefore, providing adequate education and communication to stakeholders is essential to overcome resistance to this change.

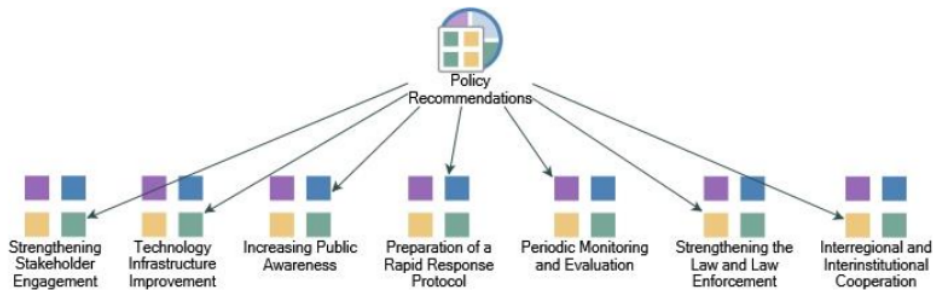
There needs to be more understanding of agile governance concepts, and the need to actively involve stakeholders can also hinder the implementation of this approach. In forest and land fire control, a strong understanding of how collaboration and coordination between governments, environmental agencies, local communities and the private sector can improve response to fires is critical. A lack of awareness about the benefits of agile governance and a lack of education on implementing it can lead to a lack of clarity in stakeholder roles and responsibilities, making it challenging to implement this approach in practice. In facing these factors, Riau Province must strive to overcome these obstacles. This involves better resource allocation, more intensive communication and education efforts to stakeholders, and persuasive efforts to change attitudes of resistance to change.

In attempts to contain forest and land fires, a lack of resources, opposition to change, and a lack of knowledge of agile governance can have serious consequences if allowed uncontrolled. Forest and land fires are a threat that can damage the environment, harm the economy and threaten community safety. More trained personnel, limited budgets, and adequate equipment must be needed to ensure practical response efforts, increasing the risk of more significant damage. Resistance to change can also slow the implementation of new methods that may be more responsive to fire threats. Therefore, immediate action in resource allocation, strong communication, and education are essential to avoid the adverse impacts that could arise if these obstacles are not addressed quickly. Thus, this factor needs to be studied further by the government and the parties involved.

Policy Recommendations Required

Over the last few decades, controlling forest and land fires has become a severe challenge. Adopting an agile governance approach has been introduced to improve response to these threats, although there is still room for improvement. To maximize the effectiveness of this approach, several supporting policies are needed. This paper will outline several important policy recommendations to prevent and overcome cases of forest and land fires, especially in supporting the agile governance approach.

Figure 5. Policy Recommendations Needed In the Context of Agile Governance In The Case Of Forest Fires in Riau



Source: Captured From Nvivo 12 by Researcher (2023)

This study examines relevant findings and literature in developing these policy recommendations. The policy recommendations outlined above are essential to improve efforts to control forest and land fires. First, strengthening stakeholder involvement through collaborative forums will create more effective cooperation across various sectors. The involvement of local governments, environmental agencies, local communities and the private sector will ensure that diverse knowledge and resources can be used efficiently in fire responses. Second, improving technological infrastructure is the foundation for better fire monitoring and analysis. Investments in modern firefighting equipment, weather monitoring technology and sensors, satellites and drones will enable a faster and more accurate response to changing fire situations (Kanga et al., 2017; Ozenen Kavlak et al., 2021).

Third, public awareness about the risk of forest and land fires is essential. Effective education and communication programs will help communities understand their role in fire prevention

and reporting and the importance of collaboration in an agile governance approach (Bento-Gonçalves & Vieira, 2020; Ibrahim et al., 2023). Fourth, a clear, rapid response protocol is crucial for fires. Creating an organized emergency action plan, efficient resource allocation and fast coordination between stakeholders will minimize losses due to fire (Downey & Myers, 2020). Fifth, regular monitoring and evaluation will help measure the effectiveness of implementing agile governance (Çolak & Sunar, 2020). By understanding what is working and what is not, Riau Province can make necessary improvements in their approach to forest and land fires.

Sixth, strengthening the law and law enforcement is the basis for dealing with perpetrators of illegal burning. Strict punishment will be a strong deterrent, and strict forest protection will reduce the risk of burning (Elvan et al., 2021). Finally, inter-regional and inter-institutional collaboration will maximize available resources and knowledge (Arifudin et al., 2013; Ribeiro et al., 2015). The exchange of information and experience between Riau Province and other regions and collaboration between related institutions will increase the capacity to deal with forest and land fires. By holistically implementing this series of policies, Riau Province can strengthen its agile governance approach in handling forest-land fire cases, reducing risks, and protecting the environment and communities from the negative impacts of fire. With joint efforts, Riau Province can achieve better results in facing these challenges.

The complexity and serious effects of forest and land fires make the policy outlined mentioned above. **Forest and land fires are not only** a threat to ecosystems rich in biodiversity but also impact public health, environmental sustainability and regional economies. By involving various stakeholders and strengthening technological infrastructure, Riau Province will have a better capacity to respond to changing situations quickly and efficiently, which will help reduce the losses and negative impacts of fires. In addition, increasing public awareness about fire risks and strengthening laws and enforcement are essential to preventing illegal burning. The urgency lies in the need for immediate action to protect the environment, lives, and livelihoods of the people of Riau Province from this persistent threat.

CONCLUSIONS

Applying the agile governance approach in handling forest-land fire cases in Riau Province has brought several significant benefits. Flexibility in decision-making, active involvement of stakeholders, responsiveness to change, and transparency and accountability are crucial elements that have strengthened Riau Province's ability to overcome the fire threat. Through collaboration between government, environmental agencies, local communities, and the private sector, Riau Province has become more adaptive in responding to changing fire situations, monitoring and measuring the effectiveness of their efforts, and increasing public awareness of fire risks. Although there are still obstacles, such as lack of resources and resistance to change, the efforts that have been made reflect positive progress in handling forest-land fire cases.

However, please note that these obstacles should be addressed. In the face of continuing fires, policy recommendations have become urgent. Strengthening stakeholder involvement through collaborative forums, improving technological infrastructure, increasing public awareness, developing rapid response protocols, monitoring and evaluation, strengthening law and law enforcement, and promoting inter-regional and inter-institutional cooperation are crucial steps. The urgency lies in the need for immediate action to protect the environment, public health, and regional economy from the negative impacts of continuing forest and land fires. By



holistically implementing this set of policies, Riau Province can strengthen their agile governance approach, reduce risks, and achieve better results in facing these challenges.

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