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"FORGING A FIRE-FREE FUTURE: EXAMINING COLLABORATIVE GOVERNANCE APPROACHES TO TACKLE FOREST AND LAND FIRES IN INDONESIA"

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Abstract

Forest and land fires in Indonesia have developed into an urgent global issue and require urgent attention beyond national borders. This annual occurrence during the dry season underscores the importance of a speedy resolution. After the forest and land fires in 2015, the Indonesian government started a collaborative effort involving various government and non-government stakeholders in 2016 to overcome this crisis jointly. This research aims to analyze multi-stakeholder collaboration in controlling forest and land fires in Indonesia using a collaborative governance framework that is theoretically interesting. The main research questions include identifying the main characteristics and causes of forest and land fires in Indonesia, studying how collaborative governance has been applied in fire control, and exploring the challenges and opportunities in its implementation. The study revealed that human factors, driven by the expansion of oil palm plantations and the use of cost-saving methods in land clearing by the pulp and paper industry, are the leading causes of repeated fires. The annual El Niño phenomenon worsens the situation but is not the primary catalyst. In addition, significant progress has been made in fire control since 2016, characterized by the establishment of strong regulations and fire control task forces at various levels. The decision-making process is now more bottom-up, thereby increasing collaboration. Despite these advances, challenges remain both within and outside the collaborative framework. In collaboration, the main problems include a lack of actor knowledge, financial constraints, and lack of accountability and transparency. External challenges include corruption, transnational responsibilities, and socio-political-economic factors. Collaboration cannot be said to have failed but must continue to be perfected. This study concludes with five exit strategies as main recommendations to overcome existing challenges. Using a qualitative research approach, in-depth interviews with stakeholders directly involved, equipped with observational data and validated documents, became the basis for this research.

Keywords: Forest and land fires; collaborative governance; stakeholders; collaboration; fires; el-nino

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Abbreviations	In Bahasa Indonesia	In English
A		
ARI	Infeksi Saluran Pernapasan Akut	Acute Respiratory Infection
B		
Babinsa	Bintara Pembina Desa	Village Trustee Noncommissioned Officer - Indonesian Army
Bappedalitbang	Badan Perencanaan Pembangunan Daerah dan Penelitian Pengembangan	Regional Development Planning, Research and Development Agency
BATAN	Badan Tenaga Nuklir Nasional	National Nuclear Power Agency
BBKSDA	Balai Besar Konservasi Sumber Daya Alam	Natural Resources Conservation Center
BEM	Badan Eksekutif Mahasiswa	Student Executive Board
Bhabinkamtibmas	Bhayangkara Pembina Keamanan dan Ketertiban Masyarakat	Community Police Officer - Indonesian Police
BLH	Badan Lingkungan Hidup	Environment Agency
BMKG	Badan Meteorologi Klimatologi dan Geofisika	Meteorology Climatology and Geophysics Agency
BNPB	Badan Nasional Penanggulangan Bencana	National Disaster Management Agency
BPDB	Badan Penanggulangan Bencana Daerah	Regional Disaster Management Agency
BPKAD	Badan Pengelola Aset dan Keuangan Daerah	Regional Assets and Finance Management Agency
BPKP	Badan Pengawas Keuangan Pembangunan	Financial and Development Supervisory Agency
BPN Provinsi Riau	Badan Pertanahan Nasional	National Land Agency of Riau Province
BPPT	Badan Pengkajian dan Penerapan Teknologi	Agency for the Assessment and Application of Technology
BPS	Badan Pusat Statistik	Central Bureau of Statistics

BRG	Badan Restorasi Gambut	Peatland Restoration Agency
BRGM	Badan Restorasi Gambut dan Mangrove	Peatland and Mangrove Restoration Agency
BRIN	Badan Riset dan Inovasi Nasional	National Research and Innovation Agency
BWSS III	Balai Wilayah Sungai Sumatera III	River Center of Sumatera Region III
C		
COPD	Penyakit paru obstruktif kronik	Chronic obstructive pulmonary disease
D		
Dinas PMD dan Dukcapil	Dinas Pemberdayaan Masyarakat Desa dan Kependudukan dan Catatan Sipil	Village Community Empowerment and Population and Civil Registry Office
DKI Jakarta	Daerah Khusus Ibukota Jakarta	Special Capital Region of Jakarta
DLHK	Dinas Lingkungan Hidup dan Kehutanan	Environment and Forestry Service
DPMPTSP	Dinas Penanaman Modal dan Pelayanan Terpadu Satu Pintu	One-Stop Integrated Investment Office
DPRD	Dewan Perwakilan Rakyat Daerah	Regional House of Representatives
E		
ENSO	El Nino Osilasi Selatan	El Nino Southern Oscillation
H		
HTH	Hari Tanpa Hujan	Days Without Rain
I		
ISPU	Indeks Standar Pencemar Udara	Air Pollution Standard Index
J		

Jikalahari	Jaringan Kerja Penyelamat Hutan Riau	Riau Forest Rescue Network
K		
Kasi Intel Korem 031/WB	Kepala Seksi Intelijen Komando Resor Militer 031 /Wirabima	Intelligence Section Chief of Military Resort Command 031/Wirabima
Kemenkes	Kementerian Kesehatan	Ministry of Health
KLHK	Kementerian Lingkungan Hidup dan Kehutanan	Ministry of Environment and Forestry
Korem 031/WB	Komando Resor Militer 031 / Wirabima	Military Resort Command 031 / Wirabima
L		
Lanud	Pangkalan Udara	Airbase
LAPAN	Lembaga Penerbangan dan Antariksa Nasional	National Institute of Aeronautics and Space
LHK Office	Dinas Lingkungan Hidup dan Kehutanan	Environment and Forestry Service
M		
MoEF	Kementerian Lingkungan Hidup dan Kehutanan	Ministry of Environment and Forestry
MPA	Masyarakat Peduli Api	Fire Awareness Community
N		
NGO	Lembaga Swadaya Masyarakat	Non-Governmental Organization
P		
P3E Sumatera	Pusat Pengendalian Pembangunan Ekoregion Sumatera	Sumatra Ecoregion Development Control Center
Polda Riau	Kepolisian Daerah Riau	Riau Regional Police

POLRI	Kepolisian Republik Indonesia	Indonesian Nasional Police
PUPR Office	Dinas Pekerjaan Umum dan Perumahan Rakyat	Public Works and Housing Office
R		
RSN Airbase	Pangkalan Udara Roesmin Nurjadin	Roesmin Noerjadin Airbase (Air base in Pekanbaru, Riau)
S		
Satpol PP	Satuan Polisi Pamong Praja	Civil Service Police Unit
SPI	Indeks Curah Hujan Standar	Standardized Precipitation Index
T		
TMC	Teknologi Modifikasi Cuaca	Weather Modification Technology
TNBT	Taman Nasional Bukit Tiga Puluh	Bukit Tiga Puluh National Park
TNI	Tentara Nasional Indonesia	Indonesian National Army
TNI AD	Tentara Nasional Indonesia - Angkatan Darat	Indonesian Armed Forces
TNI AL	Tentara Nasional Indonesia - Angakatan Laut	Indonesian Navy
TNI AU	Tentara Nasional Indonesia - Angkatan Udara	Indonesian Airforces
TNTN	Taman Nasional Tesso Nilo	Tesso Nilo National Park
W		
Walhi	Wahana Lingkungan Hidup	Environmental Forum
WWF	Dana Dunia untuk Alam	World Wide Fund for Nature
Y		

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1. Introduction

1.1 Environmental crisis: forest and land fires in Indonesia

Addressing the environmental crisis, one of the most pressing global issues is undoubtedly global warming, which poses a significant threat to human well-being (Othman et al., 2009). As countries increasingly recognize the urgency of the situation, they are actively seeking ways to mitigate the escalation of global warming. Among the prominent strategies for curbing its impact is the strategic utilization of tropical rainforests, often called the "lungs of the world." Alisjahbana & Busch, 2017; Dohong et al., 2017; Hasyim et al., 2020; Laurance, 2008; Lohmann, 2021). Tropical rainforests hold immense potential in their capacity to absorb carbon emissions stemming from human-driven industrial activities (Alviya et al., 2018; Hepburn, 2007; Jaenicke et al., 2010; Kiely et al., 2019; Liu et al., 2015; Muttaqin et al., 2019). By acting as carbon sinks, these ecosystems play a critical role in sequestering atmospheric carbon dioxide and thus mitigating the greenhouse gas effect that drives global warming.

Indonesian rainforests are vital for the world in preventing climate change. Indonesia is a country that has a large forest area. Therefore, Indonesia can be crucial in saving the climate from global warming. However, what happened was that Indonesia became one of the countries experiencing deforestation the fastest (Carmenta et al., 2017; Dohong et al., 2018; Muttaqin et al., 2019; Ruysschaert & Hufty, 2020; Saputra, 2019). Most deforestation occurs due to illegal logging and the large-scale opening of oil palm plantations (Amacher et al., 2012; Damayatanti, 2013; Hasyim et al., 2020; Jaenicke et al., 2010; Masria et al., 2015). Indonesia is the largest producer of palm oil in the world, whose derivative products are used by many countries around the world (Budiman et al., 2020; Cooper et al., 2019; Gunawan, 2018; Jaenicke et al., 2010; H. Purnomo et al., 2017a, 2017b, 2019; Runkle & Kutzbach, 2014; Ruysschaert & Hufty, 2020).

In addition, the problem that occurs almost every year in Indonesia is forest and land fires. Forest and land fires usually occur in the dry season (R. B. Edwards et al., 2020a). Forest and land fires in Indonesia are forest and land fires due to human activities, which are illegal and forbidden by the regulation. Few forest and land fires occur due to natural factors (H. Purnomo et al., 2017b). Various sources indicate that forest and land fires occur because companies or communities want to convert their land to oil palm plantations. Land clearing by burning is used because it is cheaper than heavy equipment (H. Purnomo et al., 2017b).

Forest and land fires in Indonesia lead to significant forest loss and severe haze disasters (Edwards & Heiduk, 2015; H. Purnomo et al., 2019; Herry Purnomo et al., 2017). These haze disasters primarily occur because most fires happen in damaged peatland ecosystems. To convert these wet peatlands into oil palm or pulpwood plantations, large canals are created to drain the water into major rivers (Budiman et al., 2020; Dohong et al., 2018; Jaenicke et al., 2010; H. Purnomo et al., 2010; al., 2017a, 2017b). Once drained, the peatlands become highly flammable during the dry season (Runkle & Kutzbach, 2014; van Beukering et al., 2008). Fires in these dry peatlands produce much denser smoke than fires on mineral soils, leading to severe haze disasters in Indonesia. Forest and land fires in Indonesia have occurred yearly since 1997 (Tacconi & Vayda, 2006; Varma, 2003). In the past 20 years, the worst forest and land fires occurred in 2015 (Alisjahbana & Busch, 2017; R. B. Edwards et al., 2020, 2020; Herry Purnomo et al., 2017, 2017). These forest and land fires caused an economic loss of USD 16.1 Billion, which is not yet an immaterial loss such as the health of the victims (R. B. Edwards et al., 2020b; H. Purnomo et al., 2017a). At that time, Indonesia was also an exporter of smog to neighbouring countries, Malaysia, Singapore, Brunei Darussalam, and Thailand (H. Purnomo et al., 2019). Many domestic or international flights in Indonesia and some countries were stopped because of inadequate visibility conditions.

The total area burned in Indonesia from 1997 to 2021 (in hectares)		
Year	Total burned area (in hectares)	Notes
1997-1998	11.698.379	The data from these two years are combined, considering that the fires occurred from 1997 to 1998. Source: (Tacconi, 2003)
1999	44.090	Source: (Ministry of Forestry, 2009)
2000	3.016	
2001	14.329	
2002	35.496	
2003	3.545	
2004	3.343	
2005	5.501	
2006	4.140	
2007	6.974	
2008	6.793	
2009	data not available	Validated official data from both the Ministry of Environment and Forestry and other institutions are not available
2010	data not available	
2011	data not available	
2012	data not available	
2013	4.918	The data is sourced from a compilation of data issued by the Ministry of Environment and Forestry and the Ministry of Agriculture.
2014	44.411	
2015	2.611.411	
2016	438.363	
2017	165.483	
2018	529.266	
2019	1.649.258	
2020	296.942	
2021	354.582	

Table 1. Total area burned in Indonesia 1997-2021 (Tacconi, 2003, Ministry of Environment and Forestry and Ministry of Agriculture)

It can be seen in Table 1 that Indonesia has experienced forest and land fires, which are claimed to be one of the largest fires in history (Tacconi, 2003). In 1997-1998, the fires burned 11,698,379 hectares of land. Then, the forest and land fires could be controlled in 1999, with the burned area reaching 44,090 hectares.

From the data in Table 1 from 2000 to 2008, the area burned yearly still tends to be smaller than in 1997-1999. No valid data on the area burned in 2009-2012. However, according to my observations as a researcher who lives in one of the fire-prone areas (Riau Province), the fires in those years were not too large, so it can be said that the fires that occurred were too worrying but still disrupted economic activity and harmed public health.

Then, in 2013, there were 4,918 hectares of burned area, which increased by about ten times in 2014, with the total burned area reaching 44,411 hectares. Furthermore, the worst forest and land fires since 1997-1998 occurred again in 2015 when the total fire area reached 2,611,411 hectares. This figure is 58 times greater than the area burned in 2014. In the following years, forest fires still occurred with an intensity that cannot be said to be small. The area of fires always ranges from hundreds of thousands of hectares per year and has even jumped back to 1,649,258 hectares of burned areas in 2019.

The fires that occurred from 2015 to 2021 explained that the fire problem in Indonesia still needed to be resolved. Data shows a spike in the area burned from the previous year in the 2000s, only thousands to tens of thousands of hectares per year, but since 2015, it has reached hundreds of thousands to millions of thousands of hectares of burned land. The problem of forest and land fires in Indonesia still needs to be solved, and more efforts are required to solve it.

1.2 Regulations relating to the control of forest and land fires.

The government has been serious about controlling forest and land fires since it issued Presidential Regulation No. 1/2016 on the Peatland Restoration Agency (BRG). BRG is tasked with restoring damaged peatlands, one of Indonesia's main causes of forest and land fires (Wicaksono, 2019). Damaged peatlands are highly flammable and cause haze disasters. In the regulation, the government also invites all stakeholders to be involved in solving this problem. this is an important

regulation that marks the collaboration of various stakeholders in solving the problem of forest and land fires.

In addition, Presidential Instruction No. 11/2015 on Improving Forest and Land Fire Control is a directive that aims to enhance the management of forest and land fires in Indonesia. This instruction emphasizes the importance of collaboration between local governments, the Indonesian National Defense Forces (TNI), the Indonesian National Police (POLRI), communities, and the private sector in preventing and suppressing forest and land fires (Meyfroidt & Lambin, 2011). This regulation recognizes the need for a comprehensive and coordinated approach to fire control by involving multiple stakeholders.

Minister of Environment and Forestry Regulation No. P.32/MENLHK/SETJEN/KUM.1/6/2016 plays a crucial role in regulating the responsibilities and duties of various forest and land fire control entities. This regulation outlines the roles of local governments, the TNI, POLRI, business license holders, and communities in managing and preventing forest and land fires. It serves as a critical reference for collaboration and coordination at the national level, ensuring that all relevant parties are aware of their responsibilities and work together effectively to address the issue.

Presidential Instruction No. 3 of 2020 on forest and land fire prevention focuses on strengthening coordination between government agencies at the central and regional levels in dealing with forest and land fires in Indonesia. This regulation recognizes the importance of intergovernmental cooperation and aims to improve the effectiveness of fire prevention efforts. By enhancing coordination, this instruction seeks to streamline communication and decision-making processes, ensuring a more efficient and integrated fire prevention and management approach.

These regulations demonstrate the government's commitment to addressing the challenges posed by forest and land fires in Indonesia. By emphasizing collaboration, defining responsibilities, and enhancing coordination, these regulations provide a framework for effective fire control measures. Many actors are involved in controlling forest and land fires. There is the Ministry of the Environment and Forestry, the National Disaster Management Agency, the military, the Police, and the local government. The private sector is also an actor, especially for several companies related to forestry and oil palm plantations. National and local NGOs are also involved, and the last one is the local community, where there is already a community called the Fire Care Community in various regions in Indonesia. This multi-actor collaboration is designed to tackle the environmental crisis in Indonesia, known as forest and land fires in Indonesia.

Within existing literature, multi-actor/multistakeholder collaboration is a tangible manifestation of collaborative governance, an outgrowth of governance theory. In the context of forest and land fire control in Indonesia, the principles of collaborative governance have evolved into a cornerstone for both governmental bodies and a diverse array of other stakeholders. This approach is the foundation upon which various entities converge to address the challenges surrounding forest and land fires. This collaborative governance paradigm has found expression in discourse concrete regulations and dedicated endeavors that gained traction in Indonesia from 2016 onwards. Consequently, this research adopts collaborative governance as its primary theoretical framework, providing a robust lens through which the author can dissect the dynamics of multi-actor collaboration within Indonesia's forest and land fire control framework. This theoretical grounding enhances the analytical depth and enables a comprehensive exploration of how diverse stakeholders work in tandem to address this critical issue.

1.3 The case of forest and land fires in Indonesia is a wicked problem.

Forest and land fires in Indonesia are a wicked problem and cannot be solved quickly because they are diverse and interrelated. These problems span multiple dimensions, presenting a complex web of challenges that require a holistic and systemic approach to solving.

Budi Hidayat (2022), Head of the Kampar Kiri Forest Management Unit, explained that:

"The problem of forest and land fires is complex. The cause is not just a matter of ignorance or ignorance of companies and the public regarding government regulations but includes broader dimensions. There are strong economic factors that make this problem continue to occur."

In essence, this problem revolves around the tension between economic interests and environmental interests. Indonesia is a global leader in palm oil production and a significant contributor to the pulp and paper industry. These industries are critical to the country's economy and key in the international market. However, efforts to achieve economic growth sometimes lead to unsustainable land use practices, driven by the search for fast and cost-effective land clearing methods. This creates a fundamental conflict, pitting economic profit against environmental sustainability. Climate variability, especially in El Niño years, adds complexity to the problem. Hot and dry conditions caused by El Niño significantly increase the risk of forest and land fires. In recent years, economic pressures to meet global demand for palm oil and pulpwood have collided with growing environmental risks, creating opportunities for illegal land-clearing practices.

Jhonny Mundung (2022) Expert Staff to the Governor of Riau in the field of Environment and Forestry explained:

"El Nino makes the dry season very dry and lasts longer. This provides an opportunity for the arsonist to carry out his action. Structurally, this is also supported by Indonesia's vital role in the palm oil and pulp and paper supply chains. So, there is indeed a broad need for Indonesia worldwide."

The effectiveness of governance and law enforcement in eradicating illegal land clearing is undermined by corruption at various levels. Corruption, both in the forestry and plantation sectors and the broader political landscape, allows individuals and institutions to act with impunity. This rampant corruption not only allows illegal practices to continue but also erodes public confidence in the government's ability to address this problem. From the perspective of local communities, implementing sustainable land clearing can be prohibitive to small farmers. Traditional land clearing meland-clearings slash and burn passed down from generation to generation. These forests were once environmentally friendly when the ecosystem was more resilient, and fires could be controlled. However, these practices persist due to historical legacies and economic constraints small-scale landowners face.

One informant who did not want to be named (2022) explained:

"Corruption, collusion, and nepotism are still big problems in Indonesia's forestry and palm oil industries. There is much data from various institutions that explains this. This is a significant motivating factor for forest and land burning perpetrators to buy "the law" and they can be free and repeat these actions."

To overcome the problem of forest and land fires in Riau, a collaborative governance approach is needed. This approach involves all stakeholders, including government, local communities, NGOs and international institutions, in a joint effort to address this problem. This includes increasing sustainable land use practices, increasing law enforcement, and seeking alternative slash-and-burn techniques. It also requires comprehensive research to understand better fire behavior, its predictability, and long-term ecological impacts. In conclusion, forest and land fires in Indonesia are a terrible problem that cannot be solved. Resolving this problem requires multifaceted, coordinated, and sustained efforts to balance economic interests with environmental concerns and to address the systemic challenges that allow illegal land-clearing practices to continue.

1.4 Objective of the research

This research explores the intricacies of forest and land fire management in Indonesia, focusing on a case study in Riau Province. The urgency of understanding and addressing this issue was underscored by severe fire incidents in 2015 and 2019. Using a qualitative research approach, this study aims to dissect various aspects of forest and land fires, investigating the characteristics and underlying causes that perpetuate their occurrence. Guided by Ansell and Gash's (2008) collaborative governance model, the analysis examines the implementation of collaborative governance in Indonesia's forest and land fire management context. The model strongly emphasizes stakeholder engagement, coordinated efforts and shared decision-making processes - all critical in formulating effective fire management strategies. By investigating the nuances of collaborative governance implementation, this research seeks to provide valuable insights into improving fire management practices in Indonesia.

In the introduction section of this dissertation, the background of the research is explained by highlighting the severity and persistence of forest and land fires in Indonesia, with a particular focus on Riau Province. Adding a concluding paragraph to the introduction can emphasize the urgency of addressing this issue and underline the potential transformative impact of collaborative governance in mitigating forest and land fires. In addition, it is essential to highlight the relevance of the chosen theoretical framework in guiding the research and promoting a comprehensive understanding of the complex factors involved in fire control efforts.

Regarding research novelty, the investigation into collaborative governance in Indonesia's forest and land fire management domain - supported by a case study in Riau Province - enriches the existing literature by investigating the unique complexities of this domain and its challenges. By focusing on collaborative governance in this context, this research adds to our understanding of its

complexities and failures. This research bridges a significant gap in the current literature by examining the characteristics and causes of forest and land fires, the application of collaborative governance, and the existing challenges and opportunities. It provides actionable insights for policymakers and practitioners.

In closing, it is essential to recognize that collaborative governance is prone to failures and obstacles. Related issues such as accountability, participatory ideals, strategic goals, institutional design, power dynamics, rent-seeking behavior, and communication breakdowns can all contribute to the faltering of collaborative governance initiatives. These challenges are particularly relevant in Indonesia's forest and land fire management domain. However, by dissecting and understanding these failures, this research is a repository of valuable lessons for improving future collaborative governance efforts. The study of collaborative governance shortcomings in the context of forest and land fire management in Indonesia, with a case study in Riau Province, increases the field's sophistication and introduces a new perspective by addressing specific challenges.

1.5 Research questions and research framework

Research Questions in this study are:

1. RQ1: How has collaborative governance been implemented in forest and land fire control in Indonesia?
2. RQ2: What are the challenges and opportunities for implementing collaborative governance in land and forest fire control in Indonesia?

This study addresses two research questions. Readers can refer to the research framework visualized in Figure 1 to facilitate a clear understanding of the research progression. This framework visually illustrates the interconnectedness and logical flow of the research, aiding readers in grasping the contextual relationships between the research questions and their subsequent analysis.

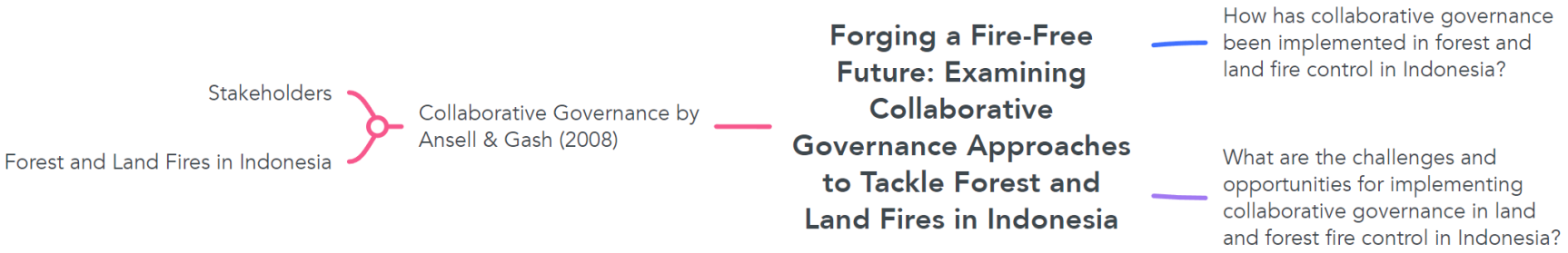

Figure 1. Research framework (My own Synthesis)

1.6 The structure of the dissertation

This dissertation follows a structured format, starting with:

Chapter 1, an introductory section that lays an essential foundation for the study. This chapter covers key elements such as the research background, objectives, research questions, and hypotheses, accompanied by a clear research framework.

Chapter 2 presents a broad and thorough literature review, delving deeper into the theory of collaborative governance. This section provides a comprehensive understanding of the theoretical underpinnings of this research.

Chapter 3 explains the research methodology used in this study, which is based on qualitative case study research techniques. This chapter outlines the research methods, rationale, data collection and analysis strategies.

Chapter 4 is dedicated to an in-depth exploration and analysis of the Implementation of collaborative governance in Indonesia's forest and land fire control. It examines the practical aspects of collaborative governance in addressing forest and land fires.

Chapter 5 critically examines the challenges and opportunities associated with the implementation of collaborative governance for forest and land fire management in Indonesia. This chapter provides insights into the difficulties encountered and potential avenues for improvement.

Chapter 6 concludes this dissertation. This chapter synthesizes and discusses the research findings in the context of broader research objectives. Recommendations, implications, and potential avenues for future research are also highlighted, thus providing a comprehensive conclusion to the study.

2. Literature review/Theoretical framework

2.1 Governance: When the Government (State) is no longer the most dominant actor.

The term governance is distinct from the term government. The term "government" refers to the organizations or institutions that exercise government authority. This government concept can be considered archaic in government administration because it exclusively emphasizes the government (government institutions/institutions) as the sole regulator and implementer of government administration. As a result, the concept of governance emerged to supplant the concept of government in the study of government. Additionally, governance derives from the word "govern" and refers to the act of taking on a more significant role (Dwiyanto, 2015:1). It encompasses all processes, rules, and institutions that enable the management and control of society's collective problems. Thus, governance encompasses all of society's institutions and elements, both government and non-government.

Over the last several decades, the concept of governance has become incredibly popular and has become one of the most frequently used terms in political science (Ansell & Torfing, 2016; Peters, 2011; Peters & Pierre, 1998). Governance was widely explored and embraced for the first time in the late 1980s. Additionally, it was attractive because it encompassed a broad range of factors that were becoming increasingly important but under-recognized in conventional thinking and promoted a more integrated understanding of how these factors were or should be, connected. Governance scholars viewed the political system as a complex of ill-defined and unstable formal and informal arrangements. This was a subtle refutation of the conventional view of governments as formal, easily identifiable, and static entities. Unlike the government, which conjured an image of formal structures ruling over people, governance emphasized the growing importance of

formal and informal arrangements in the political economy (Kemp et al., 2005:17). For example, one French scholar has referred to this term as a 'fetish.' Additionally, the term has become prevalent in the discussions and publications of international organizations, particularly those charged with improving the lives of people living in poverty and oppression throughout the world. The term "governance" has also been applied to the management of organizations in the private sector, with interest in corporate governance growing in popularity in the aftermath of major corporate failures such as Enron and Lehmann Brothers (Peters, 2011: 63). The World Bank is an institution that later became a pioneer in implementing the concept of governance in various countries globally. Governance became popular when the World Bank reintroduced 'governance' in a World Bank Report in 1989. That year marked a turning point in the emergence of governance issues in the thinking of the World Bank. The World Bank sees its role as facilitating legal communication, ensuring legal consistency, updating the legal system, and training the judiciary. The model of the legal and bureaucratic system is a Western liberal model (Williams & Young, 1994: 87).

How do we define governance? In much present-day use, governance refers to a new governing process, a changed condition of the ordered rule, or the a method of governing society (Rhodes, 2007: 1247). Governance minimizes the role of the state (government), which in the previous era dominated various processes, especially those related to the fulfillment of community welfare. The concept of governance makes the state only one actor, among other actors such as civil society and the private sector. Stoker (2018:16) introduces the five prepositions that explain the concept of governance:

1. "Governance refers to a set of institutions and actors drawn from but also beyond government.
2. Governance identifies the blurring of boundaries and responsibilities for tackling social and economic issues.
3. Governance identifies the power dependence involved in the relationships between institutions involved in collective action.

4. Governance is about autonomous self-governing networks of actors.
5. Governance recognizes the capacity to get things done, which does not rest on the power of the government to command or use its authority. It sees government as able to use new tools and techniques to steer and guide."

An element of the notion of governance signals' attraction is a weakening of the state-centric view of power and societal steering, which recent empirical and ideological developments have challenged. Another factor contributing to the appeal is that "governance" views private and civil society actors as resources and instruments for co-producing public policy rather than passive targets and public regulation subjects (Ansell & Torfing, 2016). This view is consistent with the post-liberal call for the development of active citizenship and the decentering of power in the post-modern era. Both tend to emphasize the concept of "regulated self-regulation," which encourages individual and collective actors to interact in relatively autonomous arenas that are facilitated and regulated by distantly governing public authorities (Sørensen & Triantafillou, 2009).

To better understand the concept of governance in greater depth, Rhodes (1996: 660) describes several characteristics of governance:

1. "Interdependence between organizations. Governance is broader than government, covering non-state actors. Changing the state's boundaries meant the boundaries between public, private, and voluntary sectors became shifting and opaque.
2. Continuing interactions between network members, are caused by the need to exchange resources and negotiate shared purposes.
3. Game-like interactions, rooted in trust and regulated by rules of the game negotiated and agreed by network participants.
4. A significant degree of autonomy from the state. Networks are not accountable to the state; they are self-organizing. Although the state does not occupy a privileged, sovereign position, it can indirectly and imperfectly steer networks."

Governance facilitates possibilities for various sectors to connect with or contribute to the public sector. The government is neither the sole nor the most powerful actor in governance. Furthermore, the opinion explains how the

government's authority over public affairs has been diminished. This definition can be interpreted as a state in which the government is confronted with problems that exceed its capacity or capability, necessitating the involvement of other parties with greater capacity or capability and, of course, the ability to assist the government. This situation exists due to the government's limited financial and resource capacity.

The government, the private sector, and the community cooperate in the governance process. The government is no longer the sole actor monopolizing government administration but requires additional actors due to the government's limited capacity. With its financial support, the private sector must assist the government in administering the government. In this case, the private sector is prohibited from acting in its self-interest, i.e., solely for personal gain. Additionally, the community must be involved. It is pointless if the community desires to participate in government administration but is denied the opportunity. This community involvement can develop an autonomous community and ultimately improve the quality of society.

Governance is a multifaceted theoretical concept that has given rise to numerous derivative theories. Collaborative governance theory takes center stage as the primary theoretical framework in this study. In the subsequent section, we will delve into the foundational significance and positioning of collaborative governance theory within the context of research concerning forest and land fires in Indonesia.

2.2 Collaborative Governance: Multi-actor collaborations from different backgrounds

Public management scholars have observed increased collaborative networks among state and local governments over the last few decades (Silvia, 2011). Some

commentators claim that collaborative governance arrangements are becoming more common. Others argue that many refer to collaboration when it means different ways of working together (Lahat & Sher-Hadar, 2020). According to Chris Ansell & Gash (2008: 544), Collaborative Governance is "A governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process that is formal, consensus-oriented, and deliberative and that aims to make or implement public policy or manage public programs or assets." If referring to the meaning of Connick & Innes (2003:180), Collaborative Governance represents all interests relevant to the case being handled. According to (Emerson et al., 2012: 2), collaborative governance is "the processes and structures of public policy decision making and management that engages people constructively across the boundaries of public agencies, levels of government, and the public, private and civic spheres in order to carry out a public purpose that could not otherwise be conflict accomplished." The essence of state and non-state actors (private and public) who have similar concerns then collaborate to resolve public issues correctly. In essence, collaborative governance is frequently defined as a process of collective decision-making that enables diverse groups of actors with an interest or stake in a particular policy or management issue to collaborate on mutually beneficial outcomes.

Collaborative governance is a collaboration to revitalize government, which refers to a broader context, namely the administration of the government. In this instance, collaborative governance focuses on the voluntary aspects of collaborative practice. It is hoped that the voluntary nature of each actor participating in the collaboration works optimally to accomplish the collaboration's objectives. Thus, the program or policy will be more effective due to the organizational or institutional relationships involved. There are two main reasons why Collaborative Governance is considered a way to resolve existing public issues. The first is accommodating the community's involvement and participation, which is vital in consolidating democracy and rejuvenating democracy. Almost all

countries embrace democracy in politics; therefore, the collaborative concept is essential. Secondly, the cooperation of the community and the government eases the state's burden in providing and delivering goods, services, and welfare for the community (Kim, 2010). In essence, the state can be helped to support its burdens and obligations to solve community problems by collaborating.

It is essential to know about the criteria of Collaborative Governance. At least refer to Ansell and Gash; there are six criteria for Collaborative Governance. The six criteria are (Ansell & Gash, 2008: 544):

1. A government agency initiated the forum
2. Participants in the forum include non-state actors
3. Participants in the forum are directly involved in decision-making and are not merely consultants by government agencies
4. The forum is formally organized and holds collective meetings
5. The forum aims to make decisions based on consensus (although consensus may not be reached in practice)
6. The focus of the collaboration is in terms of public policy or public management.

Ansell and Gash then developed a contingency model for collaborative governance. This model is made by classifying and grouping various parties influencing collaborative governance management practices and predicting the expected results. The outcome of collaboration depends on the collaboration process. Meanwhile, three things are affected by initial conditions: facilitative leadership and institutional design. The following is a collaborative governance model proposed by (Chris Ansell & Gash, 2008: 550)

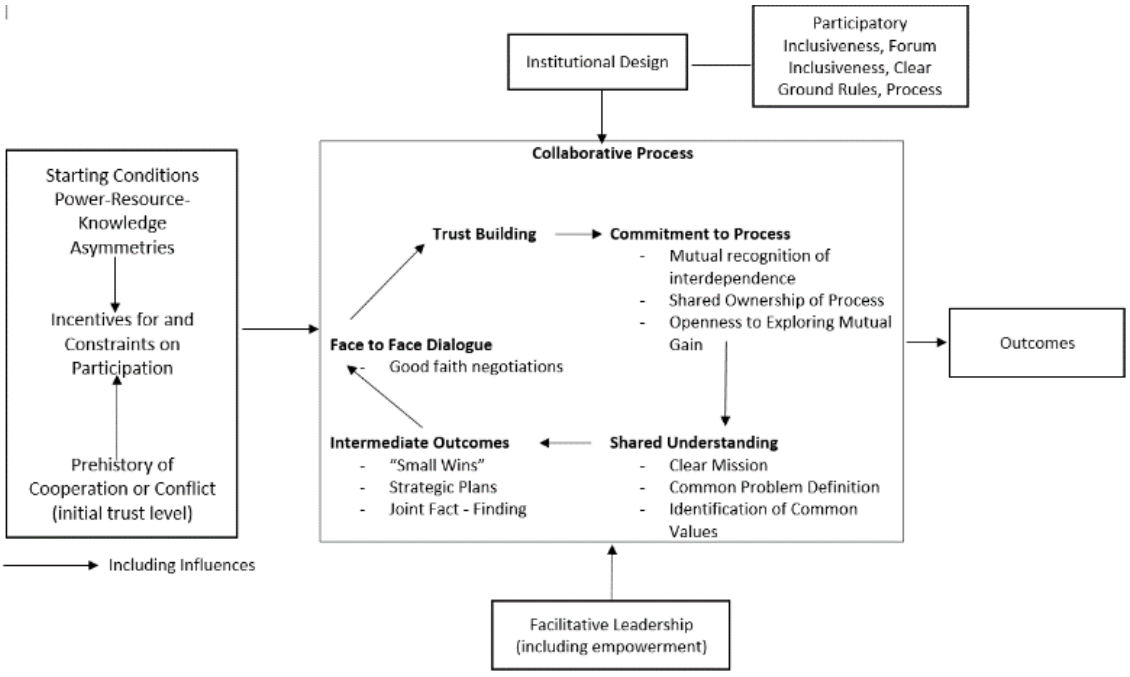

Figure 2. Ansell & Gash Collaborative Governance Model (Ansell & Gash, 2008: 550)

1.1. Initial Condition

The first thing that must be considered in collaboration is a shared vision for the initial conditions. If the actors involved have the same direction and views on the collaboration agenda that will be carried out, everything is expected to run more smoothly. The dissimilarity of vision or the history of conflict between the actors involved can be a significant obstacle in future collaboration. These things should be avoided, of course. However, a shared vision makes actors respect each other and is equally important and needed. This destroys the sectoral ego that usually haunts many collaboration agendas. There are three essential variables in the initial conditions: the difference in resources between the actors involved, the incentives received by each actor, and the history of conflict and cooperation between actors.

1.2. Institutional Design

Institutional design is an essential element in implementing the collaboration agenda. The existence of formal ground rules means this institutional design. These basic rules must be clearly stated in a document. With that, collaboration has a mutually recognized legality. The basic rules can contain the game rules in collaboration, such as each actor's main tasks and functions. This must be clear to minimize overlapping roles and friction in future programs. Regarding collaboration actors from the government, it must be open so that everything can run transparently.

1.3. Facilitative Leadership

Facilitative leadership here means that collaboration must have a good leadership aspect. Leadership is essential for establishing and maintaining clear ground rules, building trust, facilitating dialogue, and exploring mutual benefits. To that end, three central components can demonstrate effective leadership in collaboration, namely:

1. Adequate management in the collaboration process
2. Able to manage existing technical capabilities
3. Ensure that the collaboration that is carried out can be empowered to make the right and convincing decisions for all collaborating actors

1.4. Collaboration Process

The collaboration process is a point describing the collaboration as a development of the various existing stages. For example, Gray (1989) describes three stages of the collaboration process, namely problem setting (problem determination), direction setting (goal setting), and implementation. Here is the explanation:

1. Problem Setting: This stage is to define the problem, identify which parties will be involved, and then all parties can sit down together

2. Direction Setting: This stage is to formulate the basic rules of collaboration, develop a negotiation agenda and seek alternative opinions to reach an agreement
3. Implementation: This stage is to implement all decisions that have been mutually agreed

In establishing the stage to achieve the collaboration process, several points must be followed, namely having to have a face-to-face dialogue, building mutual trust (trust-building), being committed to the process (commitment to process), sharing knowledge (shared understanding), and temporary results.

Collaborative governance emerges from a variety of facets. The emergence of collaborative governance can be explained by institutions' need to collaborate, owing to their limited capacity to carry out their programs/activities. Additionally, collaboration occurs due to an institution's limited budget funds, such that the collaboration budget comes from more than one institution but all participating institutions. Collaboration can also be considered an aspect of the evolution of government science, particularly with the emergence of the concept of governance, which emphasizes the involvement of multiple actors in government administration, including the government, the private sector, and the community. Collaboration can also increase interest group involvement and prevent one institution or organization from succumbing to managerialism. The complexity that results from its development creates conditions of institutional interdependence and an increasing demand for collaboration.

The case of forest and land fires is inherently well suited to applying collaborative governance. For starters, collaborative governance strongly emphasizes the importance of stakeholder engagement, coordination and shared decision-making processes. These aspects are particularly important when dealing with complex and multi-faceted issues such as forest and land fires (Sørensen & Torfing, 2011). Given the diverse range of actors involved, from government

agencies and local communities to NGOs and private sector entities, the active participation of all these stakeholders is necessary to design and implement effective strategies to control and prevent fires.

In summary, collaborative governance theory offers a comprehensive framework for understanding and addressing the complexities of forest and land fire management. It places significant emphasis on stakeholder engagement, coordination, and shared decision-making processes, which are critical in addressing multiple challenges. In addition, collaborative governance theory recognizes the importance of establishing an open and adaptable platform for collaboration, considering social, economic, and political dimensions, and facilitating self-regulation through meta-governance. These characteristics make collaborative governance theory suitable for studying and improving forest and land fire control efforts. Ansell and Gash's (2008) Collaborative Governance Theory is well-suited for my research and serves as the primary theoretical framework.

2.3 Collaborative Governance in Natural Resource Management

The concept of collaborative governance has received significant attention in natural resource management. This approach recognizes the complexity and interconnectedness of natural resource issues and emphasizes the importance of collaboration, participation, and adaptive management. One influential theoretical explanation of collaborative governance is the theory of collaborative governance (Ansell & Gash, 2008). This theory highlights four key variables: initial conditions, facilitative leadership, institutional design, and collaborative processes. Initial conditions refer to the context and conditions that shape the collaborative process, such as a crisis or a common problem. Facilitative leadership involves the leader encouraging collaboration and creating a supportive environment. Institutional design refers to the structures and mechanisms supporting collaboration, such as forming formal or informal networks. The collaborative

process includes interaction, communication, and decision-making among stakeholders.

Collaborative governance has been applied in various natural resource management contexts, including land use, economic development, and conservation efforts (Fajrina et al., 2023). It offers a promising approach to tackling complex problems that traditional top-down approaches might need help to solve. Collaborative governance ensures that multiple perspectives and interests are considered in decision-making by involving various stakeholders, including government agencies, local communities, non-governmental organizations, and the private sector (Nindyatmoko et al., 2022). This inclusive approach can produce more effective and sustainable natural resource management outcomes. One of the main benefits of collaborative governance in natural resource management is its ability to generate trust, build relationships, and develop social acceptance of government decision-making (Arai et al., 2021). By involving stakeholders in decision-making, collaborative governance can increase transparency, accountability, and legitimacy. It also promotes shared responsibility and ownership of natural resource management results, leading to increased stakeholder commitment and cooperation(Arai et al., 2021).

However, collaborative governance is not without its challenges. An imbalance of power among stakeholders can undermine the effectiveness of collaborative processes, particularly in developing countries (Arai et al., 2021). Powerful actors, such as governments or dominant groups, may control collaborative processes and benefit disproportionately, while less powerful groups may have limited influence and access to resources. Addressing power imbalances and ensuring equitable participation is critical to successful collaborative governance in natural resource management (Arai et al., 2021).

In addition, collaborative governance requires effective communication, trust-building, and conflict-resolution mechanisms (Wiegant et al., 2022).This requires

face-to-face dialogue and setting shared goals and objectives (Nindyatmoko et al., 2022). Collaborative governance also requires an adaptive management approach, as natural resource management issues are often complex and dynamic, requiring continuous learning, monitoring, and adjustment of strategies (Olvera-Garcia & Neil, 2020)

In conclusion, collaborative governance offers a promising approach to natural resource management by engaging multiple stakeholders, fostering trust, and promoting inclusive decision-making processes. It recognizes the complexity and interconnectedness of natural resource issues and emphasizes the importance of collaboration, participation, and adaptive management. While challenges exist, such as power imbalances and effective communication, collaborative governance provides a framework for addressing these challenges and achieving more effective and sustainable natural resource management outcomes.

2.4 Collaborative Governance in Forest and Land Fire Control

The discourse surrounding collaborative governance in controlling forest and land fires in Indonesia is characterized by a complex interaction between arguments for and against. Proponents, as exemplified by Stephens & Ruth (2005), champion the effectiveness of collaborative approaches by advocating a paradigm shift towards reducing the potential for fire behaviour and emphasizing the integration of preventative measures. This strategic shift aligns with the principles of collaborative governance, highlighting the importance of being proactive rather than simply firefighting (Stephens & Ruth, 2005). Additionally, Sinta (2022) exploration of cultural strategies introduces a unique perspective, underscoring the inherent value of incorporating traditional knowledge into collaborative governance frameworks. An inclusive approach to fire prevention, rooted in cultural practices, enriches the strategies and contributes to a holistic understanding of practical fire control (Sinta et al., 2022).

In line with this, the analysis of Sundari et al. (2022) regarding sustainable forest governance in Jambi Province pays attention to the positive impact of collaboration between stakeholders in preventing forest fires. However, these supporting arguments are met with counterarguments that require careful consideration. There are concerns about the feasibility of implementing measures to reduce the potential for fires, especially in areas facing limited resources and varying environmental conditions (Sundari et al., 2022a). Potential resistance to integrating traditional knowledge into modern fire management systems, as highlighted by Sinta (2022), poses challenges, calling into question the compatibility of cultural practices with scientifically based approaches.

Additionally, Zukifli's (2022) evaluation of forest and land fire management policies during the COVID-19 pandemic introduces a temporal dimension to this discussion, emphasizing the importance of adaptive management and collaborative approaches during the crisis. However, a counterargument is emerging that adaptive management approaches may inadvertently create challenges regarding the speed and efficiency of decision-making, especially in rapidly evolving and unpredictable situations (Zukifli, 2022).

The emphasis on collaboration between various actors, as emphasized by Sundari et al. (2022), may face obstacles such as conflicts of interest, power imbalances, and difficulties in reaching consensus. These challenges underscore the complexity inherent in collaborative governance, requiring a different understanding of stakeholder dynamics. Furthermore, Arisanty's (2023) exploration of community and government preparedness in South Kalimantan raised awareness of the importance of communication, coordination, and cooperation. However, an emphasis on local community involvement may face obstacles related to resource gaps and lack of capacity in specific communities (Arisanty et al., 2023).

Regarding policy implications, Yuliani's (2023) focus on inter-organizational networks emphasizes the importance of standards, communication, and disposition in collaborative governance, offering a roadmap for effective forest and land fire control. However, potential challenges in implementation, including varying levels of commitment and resources across organizations, must be acknowledged (Yuliani, 2023). Similarly, the call of Wuryandari et al. (2022) to enforce stronger investment laws may need more support from sectors prioritizing economic development over environmental preservation, requiring a balance between the two objectives (Wuryandari et al., 2022).

In conclusion, the discourse on collaborative governance in forest and land fire control is multifaceted, with various studies presenting solid arguments for and against its efficacy. While collaborative governance holds promise in developing effective fire control strategies, a comprehensive understanding of policy challenges and implications is critical for its successful implementation in the complex context of Indonesia's diverse ecosystem and socio-political landscape.

2.5 The Failure of Collaborative Governance

A thorough literature review has been conducted to identify the causes of collaborative governance failures across various disciplines. This literature review provided valuable insights into the factors contributing to collaborative governance's shortcomings. The research focuses on collaborative governance in forest and land fire management in Indonesia, specifically in Riau Province, with the aim of enhancing the existing literature by examining governance failures in this area.

Several collaborative governance practices will be explained using data from previous studies. Numerous studies demonstrate that collaborative governance practices are not always successful and that some of them fail (Avoyan & Meijerink, 2021; Matthews & Missingham, 2009a; Pellowe & Leslie, 2020; Ullah

& Kim, 2020; Vihma & Toikka, 2021; Woldesenbet & Kebede, 2021; Zhang et al., 2021). Matthews and Missingham (2009) examined the factors that contributed to the failure of Australia's first Community Forest Management (CFM) trial, a form of collaborative governance. The study discovered that ambiguity and uncertainty regarding the strengths and objectives of CFM organizations and power relationships within organizations all contribute to the conflict that eventually undermines the CFM process. Then, Woldesenbet & Kebede's (2021) research examined stakeholders' collaboration in governing water supply in an urban context in Wolkite Town. This demonstrates that, while multiple stakeholders cooperate in some ways, governance arrangements are monopolized by several sectors. This paved the way for conflicts, a limited understanding of what constitutes drinking water, and a need for mutual understanding.

Additionally, other research indicates that collaborative governance practices may fail when collaborative institutions are unable to generate a shared understanding of the mission and decision-making ground rules, provide inconsistent facilitation, fail to build trust, and thus are unable to establish an environment conducive to learning (Vihma & Toikka, 2021). Zhang et al. (2021) demonstrated how differences in perceptions of each collaborating actor's role could impede collaborative governance in the case of the urban regeneration project in China. This is followed by the actors' lack of knowledge about the issue and the absence of a mediator to mediate existing conflicts.

Djosetro & Behagel (2020) found that weak institutional capabilities and poor communication between the actors involved were factors that could cause the failure of collaborative governance practices, while (Ansell, 2012; Morrison & Van Den Nouwelant, 2020) emphasize that clear and strong leadership will be one of the supports in successful collaboration. Therefore, unclear or weak leadership structures can lead to failure in collaboration. Several other governance scientists also say that collaboration can fail due to the inadequate capacity of the

collaborating actors (Cho & Jung, 2018; Taljaard et al., 2019; Ziervogel et al., 2016). Then, it was found that the power imbalance among the actors involved was also the cause of the hampered practice of collaborative governance (Bichler & Lösch, 2019; Erp, 2017; Kim, 2015),

The figure below has been created to illustrate the factors that hinder collaboration (which can lead to collaboration failure).

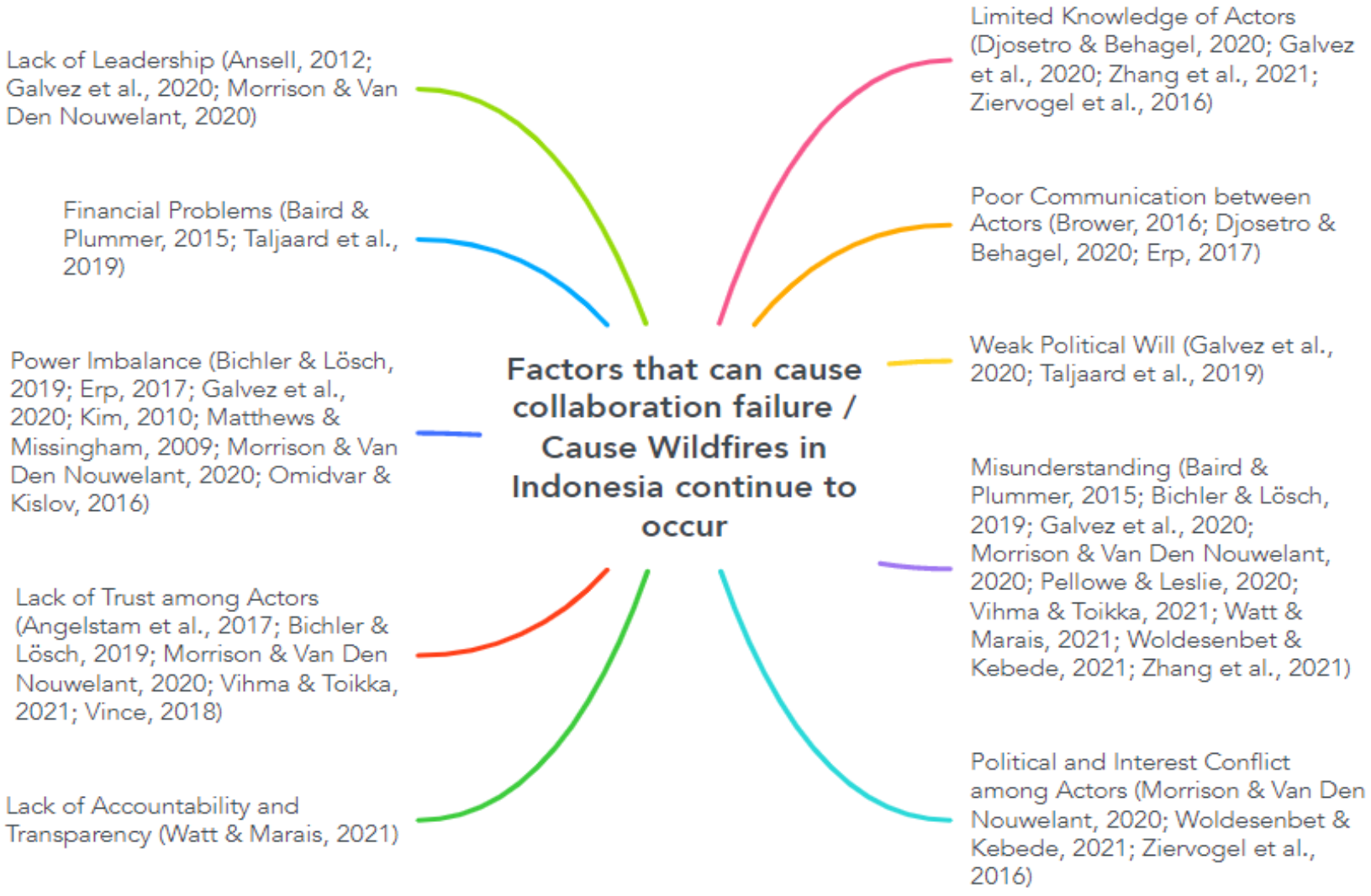

Figure 3. Map of Factors that can cause collaboration failure (my own synthesis).

It can be seen in Figure 3 above that from the various available literature, ten factors that hinder collaboration can make the collaboration fail. The ten factors are:

1. Lack of leadership

   In the collaboration process, the leadership factor is one of the main determinants of the success or failure of collaboration (C Ansell, 2012). Actors who act as leaders must apply facilitative leadership, not directives. Leaders must be able to mediate if there is a conflict between actors involved in the collaboration process (C Ansell, 2012; Galvez et al., 2020; Morrison & Van Den Nouwelant, 2020). In many cases, this weak leadership becomes a big problem when actors from different backgrounds work together to resolve the issues at hand.

2. Limited Knowledge of Actors

   Every collaborating actor must have sufficient knowledge of the issues to collaborate on. The number of failed collaborations is because many actors involved in the collaboration need to understand the issues at hand fully. This can lead to clarity for the actor and cause the collaboration process to be improved. There must be sufficient knowledge about the issues at hand so that the collaboration process runs smoothly (Djosetro & Behagel, 2020; Galvez et al., 2020; Zhang et al., 2021; Ziervogel et al., 2016)

3. Financial Problems

   Of course, a budget is needed to carry out a collaborative process, especially to solve public problems. The budget is, of course, used for various activities in collaboration. In some cases, the available budget becomes a barrier factor in collaboration. The available budget (usually provided by the government) for collective use and the individual budgets of the actors involved that are voluntarily allocated for collaboration must be sufficient. (Baird & Plummer, 2015; Taljaard et al., 2019)

4. Poor Communication between actors

In some collaboration cases, the lack of communication between the actors involved in the collaboration is the cause of the failure of collaboration. Poor communication can occur between fellow actors from the government or other actors across sectors. How can a problem be solved if the collaborating actors do not discuss it? (Brower, 2016; Djosetro & Behagel, 2020; Erp, 2017)

5. Power Imbalance

The imbalance of power in collaboration is often an inhibiting factor that causes many collaborations to fail. Too many dominant actors make other actors feel uncomfortable in collaboration. It is better if the distribution of power is agreed upon from the beginning of the initiation process so that the power of each institution is given according to its capacity (Bichler & Lösch, 2019; Erp, 2017; Galvez et al., 2020; Kim, 2015; Matthews & Missingham, 2009; Morrison & Van Den Nouwelant, 2020; Omidvar & Kislov, 2016).

6. Lack of Trust among Actors

Trust in each other among the actors involved is one of the keys to successful collaboration. What often happens is that actors who collaborate do not trust other actors, so suspicions often arise between one another. This, of course, should be avoided. In collaboration, it takes trust between good actors to complete the tasks they carry out in collaboration (Angelstam et al., 2017; Bichler & Lösch, 2019; Morrison & Van Den Nouwelant, 2020; Vihma & Toikka, 2021; Vince, 2018).

7. Misunderstanding

In a collaboration by many actors from different backgrounds, equating the perception of something becomes a challenge. Different perceptions of each other hinder the collaboration process. This difference in perception leads to the collaborating actors disagreeing about something in the middle of the collaboration process. This slows the existing collaboration process. So the process of equalizing this perception must be straightforward before the collaboration is carried out so that everything runs smoothly (Baird & Plummer, 2015; Bichler & Lösch, 2019; Galvez et al., 2020; Morrison & Van

Den Nouwelant, 2020; Pellowe & Leslie, 2020; Vihma & Toikka, 2021; Watt & Marais, 2021; Woldesenbet & Kebede, 2021; Zhang et al., 2021).

8. Weak Political Will

Weak political will, especially from the government, is one factor that hinders collaboration. Collaboration must be carried out with strong political will, especially among government actors and the primary policy-making institutions. If the collaboration is done half-heartedly, what will happen later is the unclear direction of the collaboration, resulting in the collaboration failing. (Galvez et al., 2020; Taljaard et al., 2019)

9. Lack of Accountability and Transparency

The need for more openness regarding all things related to collaboration is one factor that hinders collaboration. Honesty is needed, especially regarding funds and sources of funds from collaborating parties. It is also important to present work reports that are clear and accessible to all actors who are collaborating (Watt & Marais, 2021)

10. Political and Interest Conflicts

The existence of political conflicts and interests in collaboration is almost impossible to avoid. This is because the actors who collaborate come from various backgrounds that are different from one another. However, what must be emphasized in the collaboration process is to avoid or minimize existing conflicts so that collaboration can run well and the collaboration goals can be achieved immediately. (Morrison & Van Den Nouwelant, 2020; Woldesenbet & Kebede, 2021; Ziervogel et al., 2016).

Based on the available literature, the ten factors above hinder collaboration and can make it fail. Regarding collaborative governance practices in controlling forest and land fires in Indonesia, several factors may cause failed collaborations, and forest and land fires still occur yearly. Nonetheless, it is plausible that after the investigation, other elements were identified as contributing to the failure of collaborative implementation in Indonesia.

2.6 Indonesian Forests and Land fires

Since the late 1990s, forest and land fires have been a persistent problem in Indonesia, with a substantial increase in frequency and intensity over the past few decades (Duncan et al., 2003; Levine, 1999; Trinugroho et al., 2014; Varma, 2003; Yim, 1999). This phenomenon is intricately connected to several factors, including climatic conditions, land-use practices, and socioeconomic factors. Rising temperatures and protracted droughts have created optimal conditions for fires to rapidly spread across Indonesia's forests and peatlands, exacerbated by climate change. These hotter and drier conditions are also associated with the El Nino Southern Oscillation (ENSO) weather phenomenon, known to cause prolonged drought seasons in Southeast Asia, thereby enhancing the risk of forest and land fires(Centre, 2015; CIFOR, 2002a; Jayachandran, 2005; Levine, 1999; Tacconi & Vayda, 2006; Wicaksono, 2018; Wicaksono & Zainal, 2022).[1]

In addition to climate-related factors, human activities such as deforestation, land clearing, and agricultural practices have substantially contributed to the severity of Indonesia's forest and land fires. The Indonesian government says that the main cause of forest fires is man-made. El Nino, or dry season, which is a

[1] El Niño is a natural weather phenomenon that occurs periodically in the Pacific Ocean, where sea surface temperatures in the central and eastern Pacific Ocean become warmer than usual. The El Niño phenomenon has a domino effect that extends worldwide and can affect global weather and climate patterns.

natural factor, is only a driver of forest and land fires. Without humans burning forests or land intentionally or unintentionally, natural factors would not be able to cause the severe fires that have occurred so far. Head of the National Disaster Management Agency of the Republic of Indonesia, Lieutenant General Doni Munardo, said, "99 percent of the causes of forest and land fires are man-made". Click or tap here to enter text.

This discussion will explain the two main factors causing forest fires—natural and human— in detail:

1. Natural Factor

The weather is one of the primary natural causes of forest fires in Indonesia. The tropical climate of Indonesia can be hot and humid, but seasonal variations can create favourable conditions for forest and land fires. Specifically, the dry season (typically between May and October) can be a time of elevated fire risk. During this time, temperatures can rise while precipitation is scarce or nonexistent, resulting in drier vegetation and an increased risk of forest and land fires (Adriani et al., 2016; Alisjahbana & Busch, 2017; R. B. Edwards et al., 2020a; Fatah, 2010; H. Purnomo et al., 2019; Saharjo, 2022; Sundari et al., 2022b).

A significant contributor to forest and land fires in Indonesia is the prevalence of flammable plants. Indonesia's extensive forests and peatlands are covered with flammable vegetation. During the dry season, dry leaves, grass, twigs, and other combustible fuels can readily ignite and propagate fires. In addition, peat soils in certain regions can make it more challenging to control fires, as these soils can smolder for weeks or months, emitting large quantities of smoke and contributing to air pollution (CIFOR, 2002b; Dennis et al., 2005; R. B. Edwards et al., 2020).

Furthermore, lightning impacts can contribute to Indonesia's natural causes of forest fires (Cahyono et al., 2015; Rasyid, 2014; Tacconi, 2003; Yusuf et al., 2019). While not as common as fires caused by humans, lightning can initiate fires in extremely dry regions, such as during the dry season. Lightning strikes can devastate forests and other natural areas, occurring naturally or as part of a tempest.

2. Human Factor

One of Indonesia’s leading causes of forest and land fires is the agricultural practice of burning land, particularly palm oil plantations (Cahyono et al., 2015; Harrison et al., 2009; Indra et al., 2023; Sri Suryani & Asap Kabut Akibat Kebakaran Hutan, 2012; Tan, 1999; Yim, 1999). This involves deliberately setting fires to clear land and remove vegetation rapidly, a practice that can quickly spiral out of control and result in devastation-causing forest and land fires. In many instances, these fires are started illegally by farmers and plantation owners who lack the appropriate permits and do not adhere to regulations (B. Arifin & Setyawan, 2022; Guild et al., 2022; Rochwulaningsih et al., 2022; Saharjo, 2022; Sitanggang et al., 2022a; Yusri et al., 2022). In addition to destroying ecosystems and making forests more flammable, illegal forestry, mining, and other forms of land exploitation can also contribute to forest and land fires. Illegal logging, for instance, can leave behind flammable timber debris piles, while mining activities can expose vast areas of bare soil and rock that are more flammable (Rochwulaningsih et al., 2022).

Unmaintained or mismanaged human infrastructure, such as roads and electrical lines, can cause forest and land fires. Power lines can spark a forest and land fires if they meet trees or other vegetation. Roads can increase access to remote areas, making it simpler for people to start fires intentionally or unintentionally. Cigarette ashtrays, campfires, and fireworks are examples of human activities that can initiate forest and land fires by accident. Uncontrolled

or inadequately extinguished, these activities can spark forest and land fires. In addition, spreading urbanization and development into fire-prone areas can heighten the danger of forest and land fires. As more people migrate into these areas, the likelihood of human activities causing fires increases.

Human factors are the primary cause of forest and land fires in Indonesia, and land clearance for agriculture is one of the primary activities contributing to these fires. The demand for palm oil, extensively used in food and personal care products, has increased significantly. This has increased the number of oil palm plantations in Indonesia, especially on the islands of Sumatra and Kalimantan (Borneo) (Achyar et al., 2015; Bowen et al., 2001; Budiningsih et al., 2022; Dewi et al., 2022; Horton et al., 2022; Levine, 1999; Nurhayati et al., 2021; Puspitaloka et al., 2020; Putra et al., 2019; Rochwulaningsih et al., 2022).

Many of these plantations, however, are illegally established, frequently in protected forest areas or on territory claimed by indigenous communities. To clear these areas swiftly and affordably, farmers and plantation owners often employ the "slash-and-burn" method, where the existing vegetation is cut down and set on fire (Astuti & McGregor, 2017; Siburian, 2004; Tresno et al., 2019). The resulting flames can quickly escape control and cause extensive damage. Other human activities, such as mining and infrastructure development, contribute to the likelihood of forest and land fires in addition to illegal forestry. For instance, mining operations frequently employ massive machinery and explosives, which can cause fires. Similarly, road construction and other forms of infrastructure development can destabilize ecosystems and render them more flammable.

The results of my research also corroborate this statement. Interviews with 20 interviewees consistently indicated that the predominant cause of forest and land fires in Indonesia was anthropogenic activity, whereas natural elements acted only as supporting causes.

Mr. Made (2022), the Executive Director of Jikalahari, an environmental NGO, said.

> "Regarding the causes of forest and land fires in Indonesia, it is clear that the main cause is human activity. The results of our investigations in the field show that there are a lot of former forest fires which then turned into oil palm plantations a few months later."

Then Mr. Edwin (2022), as the Coordinator of Manggala Agni at the Ministry of Environment and Forestry, said the same thing.

> "The forest and land fires happened because someone set them on fire. Not suddenly, there is a fire due to natural conditions. Indeed, nature also contributes, such as the presence of El Nino, which makes Indonesia's dry season last a long time. However, there are very few that cause forest and land fires, as is currently the case."

Then Mr. Budi Hidayat (2022), Head of the Kampar Kiri Forest Management Unit said.

> "Land clearing for oil palm plantations is getting higher. People sometimes want a cheap way to open it by burning it. So it saves costs. If you use heavy equipment, it's expensive. Expansion of oil palm land is difficult to stop because the price is still quite high and profitable".

Based on an extensive collection of articles over the last five years, it is increasingly clear that the human factor primarily causes forest and land fires in Indonesia. The table below outlines the main findings that support this statement:

No	Source (Name, Year)	Key Points
1.	(Murniati & Suharti, 2018)	Forest and peatland fires in Riau Province, Indonesia, significantly threaten the ecosystem, causing biodiversity deterioration. Biomass burning, linked to **land clearing and peatland agriculture**, is a significant cause. **Human activities,** including slash and burn practices, contribute to 95% of fire incidents.

2.	(Syarbaini et al., 2019)	Forest and peat fires in Indonesia are not considered natural disasters due to **human factors** like deliberateness and dereliction. Burning is **a fast and low-cost land clearing method**, but **El Niño** events cause significant changes, including delayed monsoon dry conditions and increased frequency of forest fires.
3.	(Maksum et al., 2019)	**Human factors** mostly cause forest and land fires in Indonesia**;** therefore, human resources are an essential element that needs to be considered in the prevention and control of forest and land fires.
4.	(Kurniawan et al., 2020)	In 1997 and 1998, Indonesia experienced large forest fires, 99% caused by **human actions,** with economic losses ranging from $9.3 billion to $20.1 billion. 35 million people were affected, with 176 companies accused of burning forests and clearing land.
5.	(Alamsyah Siregar et al., 2021)	In Indonesia right now, forest and land fires are a common catastrophe. The causes of the fires were primarily **human-related.**
6.	(Susilawati & Syam'ani, 2021)	Forest and land fires are common in Indonesia, primarily caused by **human activities**.
7.	(Fitriany et al., 2021)	Researchers suggest **human activity clears land for agriculture,** while drought conditions from dry phase climate oscillations can exacerbate forest and land fires.
8.	(Nurlia et al., 2021)	Forest and land fires are caused by physical, ecological, socio-economic, and anthropological factors. In Indonesia, most fires are caused by **human factors, including daily needs, plantation activities, and land conflicts**.
9.	(Prayoga & Koestoer, 2021)	Forest fires are the main cause of peatland area decline in Sumatra and Kalimantan, with land clearing for industrial plantation forests being the leading cause. **Humans, individually and collectively,** also contribute to the incidence of fires in Indonesia.
10.	(Wahyudie et al., 2021)	Forest and land fires in Indonesia are primarily caused by **human factors**, with 99% being intentional or unintentional, particularly in preparing land for agriculture and plantations.

11.	(Gusmendasari et al., 2022)	Indonesia's forest and land fires are caused by **unsustainable management, land preparation for agriculture, neglect, drought, and deliberate actions.**
12.	(Muttaqien et al., 2022)	Indonesia experiences 90% of forest fires due to **human activities**, including intentional and unintentional actions like clearing land for plantations and carelessly throwing cigarette butts.
13.	(Ayuningrum & Nurhayati, 2022)	Using space in Indonesia neglects sustainability and nature conservation, with 99% of forest and land fires **caused by humans,** while natural factors account for only 1%. Fire is used for agriculture.
14.	(Falcon et al., 2022)	Indonesian forest fires are primarily caused by **humans,** including **clearing land, burning trash, and discarded cigarettes**, leading to disasters.
15.	(Indra et al., 2023)	Massive land clearing causes annual forest and land fires in Indonesia, primarily due **to human activities** like unsustainable forest management and burning by cultivators.

Table 2. List of references that support the statement that human factors cause forest and land fires.

In conclusion, while natural factors such as dry weather and lightning can contribute to forest and land fires, human activities such as illegal land use changes, forest clearing, forestry, mining, and infrastructure development are the leading causes of forest and land fires in Indonesia. To reduce the frequency and severity of forest and land fires, protect local communities and fauna, and mitigate their impact on the environment and global climate, it is essential to address these underlying causes.

Forest and land fires in Indonesia began to occur massively after the start of the industrialization of the forestry sector in the New Order era (Prihatin et al., 2019; Siburian, 2004; Sobri, 2019). Forest wood resources were extracted by land clearing for agriculture, which many parties often carried out then. Forest and land fires at that time began to occur massively, especially in Sumatra and Kalimantan

(CIFOR, 2002; Darsono, 2011; S. A. Edwards & Heiduk, 2015; S. Edwards & Heiduk, 2015; Erb et al., 2013; Harrison et al., 2009; Laurance, 2007; Towar et al., 2017).

Repeated forest and land fires in Indonesia have devastated the environment and economy. In 1982/83, a long dry season in East Kalimantan sparked massive fires, destroying 3.2 million hectares and causing over 6 trillion rupiah losses. Similarly, the 1987 forest fires, which reportedly affected 66,000 hectares, most likely affected a forest and land area ten times larger than the government recorded. These fires spread across western Sumatra, Kalimantan, and East Timor. In 1991, large fires occurred in nearly the exact locations as in 1987, consuming approximately 500,000 hectares and producing localized smoke. The National Development Planning Agency (Bappenas) recorded over 5 million hectares burned in Sumatra and Kalimantan during the 1994 forest fire season. This event contributed to the haze catastrophe that struck Malaysia and Singapore at the end of September, highlighting the need for international cooperation and initiatives to manage and prevent forest and land fires in Indonesia (Bowen et al., 2001; Rasyid, 2014)

In 1997/1998, Indonesia endured a severe drought and heat wave, which caused devastation on the islands of Sumatera and Kalimantan. The forest degradation and deforestation that ensued caused significant economic losses estimated between USD 1.62 billion and USD 2.70 billion. The thick smoke from the fires paralyzed several airports, ports, and roadways, disrupting the local economy and causing losses between USD 674 million and USD 799 million due to smoke pollution. In addition, associated carbon emissions losses totaled approximately USD 2.8 billion (Tacconi, 2003; Tacconi & Vayda, 2006).

In addition to economic losses, the haze catastrophe severely affected the public health in Sumatra, Kalimantan, and neighboring nations. Moreover, the haze crisis jeopardized the region's political stability. Given their extensive domestic and

international impact, the magnitude of these losses underscores the need for effective measures to prevent and manage forest and land fires and pollution disasters in Indonesia.

The forest and land fires in 2015 were the worst in the previous two decades. According to data, 2.6 million hectares of land ignited, resulting in a catastrophic haze event (Wicaksono, 2018, 2019; Wicaksono & Zainal, 2022). At that time, 31 provinces were affected by forest and land fires, excluding DKI Jakarta, Yogyakarta, and the Riau Islands. Land and forest and land fires charred trees, harmed forest ecosystems and caused widespread respiratory diseases and irritation due to pollution containing extremely high dust particle concentrations. The Ministry of Health reported 311 cases of pneumonia, 415 cases of asthma, 689 cases of eye irritation, 1,850 cases of skin irritation, and 110,133 cases of Acute Respiratory Infection (ARI) at the end of 2015, according to "Environmental Statistics 2019" (Badan Pusat Statistik, 2019). The number of ARI patients is significantly less than the 425,377 the Ministry of Health reported from June to mid-October. The pollution crisis forced schools to suspend teaching and learning for up to 34 days in the education sector. During the zenith of October forest and land fires, 24,773 schools were forced to close temporarily, and 4,692,537 students were required to study at home, according to the World Bank.

According to data from the Indonesian Ministry of Environment and Forestry, efforts to suppress forest and land fires in 2016 and 2017 were successful, as forest and land fire coverage was reduced to 438,000 hectares in 2016 and 165,000 hectares in 2017. Nevertheless, despite these successes, forest and land fires continued to expand in the following years, with devastating results. Forest and land fires destroyed nearly 1,600,000 hectares of land in 2019, a record high in recent years. While there was some improvement in 2020, with approximately 296,000 hectares of charred land, in 2021, there were still 354,000 hectares of land affected by forest and land fires (Greenpeace Indonesia, 2021; Greenpeace

Southeast Asia-Indonesia, 2020; Nurhayati et al., 2021; Saharjo, 2022; Saharjo et al., 2018; Saharjo & Yungan, 2014).

I have identified three main negative impacts and far-reaching consequences of forest and land fires in Indonesia. These include negative economic and environmental effects and public health.

1. Economic impact

Forest and land fires can cause significant economic damage and disruption in a nation. When forest and land fires occur, they emit smoke into the atmosphere, which can result in pollution disasters that disrupt or even halt economic activities. Long-term damage to infrastructure, enterprises, and properties can be devastating, in addition to the immediate effects of the fire.

One of the sources from the government (2022) who did not want to be named said that.

> "Forest and land fires cause negative impacts on the economy, environment and health. Related to the economy. It has not counted how many millions of dollars we have lost from many things."

Forest and land fires have historically caused billions of dollars in economic losses. For instance, forest degradation and deforestation caused by the 1997-1998 forest and land fires in Indonesia resulted in economic losses of USD 1.62 billion and USD 2.72 billion. The resulting haze pollution resulted in losses between USD 674 and USD 799 million, with the carbon emission sector estimated to have suffered losses of USD 2.8 billion.

Similarly, the World Bank estimated the 2015 forest and land fires caused a cumulative economic loss of 16.1 billion USD. Due to poor visibility caused by the smog and haze, aviation was one of the most severely impacted industries during this time. These instances illustrate forest and land fires' extensive and

dire economic effects. In addition to direct damages, there are frequently reverberating impacts on multiple sectors of the economy, which affect individuals, businesses, and governments (Alisjahbana & Busch, 2017; Ikhwan, 2016; Jayachandran, 2005; Skorková et al., 2021; Sobri, 2019; Tacconi, 2003; Tacconi & Vayda, 2006; Varma, 2003; Wicaksono & Zainal, 2022; Yusuf et al., 2019).

In addition, the economic effects of forest and land fires extend beyond the borders of Indonesia. Transboundary haze pollution caused by dense smoke from these fires has impeded sea, land, and air transportation, diminishing visibility and disruptions to trade and tourism (Palamba et al., 2023). The haze has also affected neighboring nations, including Malaysia and Singapore, resulting in economic losses for both (Kabullah, 2022). In addition to immediate losses, forest and land fires have long-term effects on the economy, such as changes in land productivity and the loss of non-timber forest products (Harmadji et al., 2022; Kiely et al., 2021).

In Indonesia, forest and land fires have been caused by the expansion of oil palm plantations, which frequently leads to deforestation (Acosta & Curt, 2019; Zukifli, 2022). This expansion negatively affects the environment and local and national economies (Zukifli, 2022). The conversion of forest land to plantations diminishes the economic value of forests and disrupts communities' way of life dependent on forest products (Harmadji et al., 2022). In addition, the fires have caused economic losses due to the destruction of valuable timber resources and agricultural land (Kurniawan et al., 2020).

In addition to tangible losses, the economic impact of forest and land fires also includes intangible costs. The health effects of fire pollution, such as respiratory diseases, have significant economic consequences in terms of healthcare costs and lost productivity (Kiely et al., 2021). Smoke and haze reduce air quality and crop yields, resulting in indirect economic effects on

sectors such as tourism and agriculture (Gill et al., 2013). In addition, the economic impact of forest and land fires includes the loss of livelihoods for communities that rely on forest resources for economic well-being (Harmadji et al., 2022).

2. Impact on the environment

Forest and land fires negatively affect the environment, particularly numerous plant and animal species. Loss of these species and the devastation of their habitats can pose a direct danger to their survival, putting them at risk of extinction. In addition, forest and land fires can cause erosion, making forest land more susceptible to the effects of precipitation and wind. In addition, forest and land fires can rapidly transform forest functions, and recovery can be lengthy. Burned forest regions frequently become plantations, resulting in a loss of ecological diversity. Forests play a vital role in the hydrological cycle, and forest and land fires can reduce their capacity to absorb and retain precipitation, resulting in a decline in water quality.

One informant from a community leader (2022) who did not want to be named said that.

> "Forest and land fires have damaged our environmental ecosystem. Many animals die; sometimes, forest and land fires affect our food crops. So not only the environment but our economy is also affected."

In addition, Deforestation is a significant outcome of forest and land fires in Indonesia. Fires frequently arise due to land clearing methods such as slash-and-burn agriculture and illegal logging. These practices cause extensive deforestation, depleting valuable ecosystems and habitats for various plant and animal species. Indonesia's significant deforestation rates contribute to its position as one of the leading global emitters of greenhouse gases (Austin et al., 2019).

Forest and land fires in Indonesia have a notable environmental impact, including air pollution. The fires emit dense smoke that contains harmful pollutants such as particulate matter (PM) and greenhouse gases. The inhalation of these pollutants negatively impacts human health, resulting in higher hospital admissions and premature death (Sinta et al., 2022). The transboundary haze pollution from the fires also affects neighboring countries, including Malaysia and Singapore, intensifying the environmental and health consequences. Forest and land fires in Indonesia have significant implications for biodiversity loss. Fires cause habitat destruction, resulting in biodiversity loss and endangering vulnerable species (Aragão et al., 2018). Deforestation disrupts ecosystems, impacting species interactions and ecosystem functioning. The decline in biodiversity has significant and enduring consequences for the ecological stability and resilience of the affected regions. Forest and land fires in Indonesia contribute to the emission of greenhouse gases, such as carbon dioxide, which plays a significant role in driving climate change. Fires emit significant quantities of carbon from vegetation and peatlands, contributing to the accumulation of greenhouse gases in the atmosphere (Aragão et al., 2018). Climate change has led to more frequent and intense forest fires, exacerbating climate change. This further complicates Indonesia's efforts to address and respond to the effects of climate change.

Forest and land fires release carbon dioxide and smoke, substantially affecting climate change and contributing to global warming. Deforestation not only reduces carbon storage capacity but also accelerates global warming. River sedimentation resulting from the transportation of dust and combustion residues through erosion is a notable consequence. Efforts have been undertaken in Indonesia to mitigate the adverse environmental effects of forest and land fires. These include the implementation of fire management programs and the establishment of early warning systems. However, enhancing and reinforcing these measures while implementing comprehensive policies and ensuring

effective enforcement is necessary. This is crucial to tackle the underlying causes of the fires, which include illegal land clearing and unsustainable agricultural practices. International cooperation and support are essential for addressing the transboundary environmental impacts of the fires.

In summary, forest and land fires in Indonesia have resulted in significant adverse effects on the environment. The fires have resulted in deforestation, air pollution, biodiversity loss, and the emission of greenhouse gases. The environmental consequences present considerable obstacles to achieving sustainable development and addressing climate change. Indonesia must prioritize effective fire management strategies, sustainable land use practices, and international cooperation to address forest and land fires' underlying causes and environmental consequences.

3. Impact on health

The significant and foreboding threat posed by forest and land fires poses a grave risk to human respiratory well-being, resulting in profound and far-reaching implications and burning organic matter results in the emission of a complex mixture of gases, compounds, particles and toxic substances, which can have a detrimental effect on the respiratory system, thereby causing an imbalance in its delicate balance. This harmful act of inhaling pollution has the potential to result in a variety of respiratory disorders, including but not limited to asthma, bronchitis, pneumonia, and chronic obstructive pulmonary disease (COPD), all of which can significantly impact a person's quality of life (Abidin et al., 2019; B. Arifin & Setyawan, 2022b; Faisal & Susanto, 2019; Frankenberg et al., 2010; Schoch-Spana, 2007).

Several community members solicited direct feedback regarding the effects of forest and land fires on their health and reported having negative health

consequences. One informant who did not want to be named (2022) also said the same thing,

> "We, when there are forest and land fires, are stressed. If you leave the house, you obviously can't because we have respiratory diseases. Breathing is difficult. Everywhere every year, wear thick masks. Children are also closed from school because of forest and land fires. We hope a lot that this problem will be resolved soon."

In addition to lasting consequences, individuals experience acute symptoms that make the basic act of breathing a grueling occupation. Smoke irritates the throat and lungs, causing symptoms such as persistent cough, sore throat, runny nose, eye irritation and severe headaches. In hazardous substances, carbon monoxide, nitrogen oxides and delicate particulate matter (PM2.5) quietly penetrate the respiratory system, triggering inflammation and intensifying pre-existing respiratory conditions (Schoch-Spana, 2007). In addition, prolonged exposure to smoke from forest fires presents a significant threat to cardiovascular health, increasing the likelihood of severe consequences such as myocardial infarction, cerebrovascular accident and even death. Breathing in small particles initiates a series of complicated processes, leading to systemic inflammation, oxidative stress, vascular injury, and increased blood clotting, ultimately resulting in increased susceptibility to cardiovascular events (Faisal & Susanto, 2019).

In short, the urgent need to address the impact of haze from forest and land fires on public health requires immediate and decisive action. This phenomenon poses multiple hazards to the respiratory and cardiovascular systems, resulting in primary symptoms and potentially long-lasting consequences. It is imperative to take decisive action to address the health risks associated with these fires. Strategies such as seeking shelter indoors, using an air purifier, and using a respirator are critical protective measures against the adverse consequences of smoke exposure.

2.7 Forest and land fires in Riau Province: What happened and who caused it?

The province of Riau is situated in a geographically advantageous position on the eastern coastline of Sumatra, between the South China Sea and the Strait of Malacca. The strategic geographical position of this location has facilitated its emergence as a crucial trading center within the region, as illustrated in Figure 4. Riau, located between the economically influential nations of Malaysia and Singapore, assumes a pivotal role in facilitating trade and commerce between these prominent Southeast Asian entities.

Riau, situated close to Malaysia to the north and Singapore to the east, benefits from its land borders and maritime proximity to these neighboring countries. This geographical advantage has fostered strong economic connections, bolstering Riau's role as a prominent regional hub for trade and investment. The province's advantageous geographical position has also garnered significant foreign investment, notably from Malaysia and Singapore, as these countries acknowledge the region's potential for economic expansion and affluence.

The economy of Riau Province is characterized by its rich and varied resources, such as oil, gas, timber, and palm oil, which play a significant role in driving its economic growth. The province's valuable assets have contributed to the region's sustained economic growth and attracted investors from Malaysia and Singapore, particularly in industries such as manufacturing and energy. Riau's strategic location as a significant hub for trade and investment in Southeast Asia, coupled with its robust economic standing and abundant natural resources, has firmly established it as a highly appealing destination for businesses and investors. Through its advantageous geographical position and the promotion of sustainable development methodologies, Riau can thrive as a significant participant in the region's economic framework.

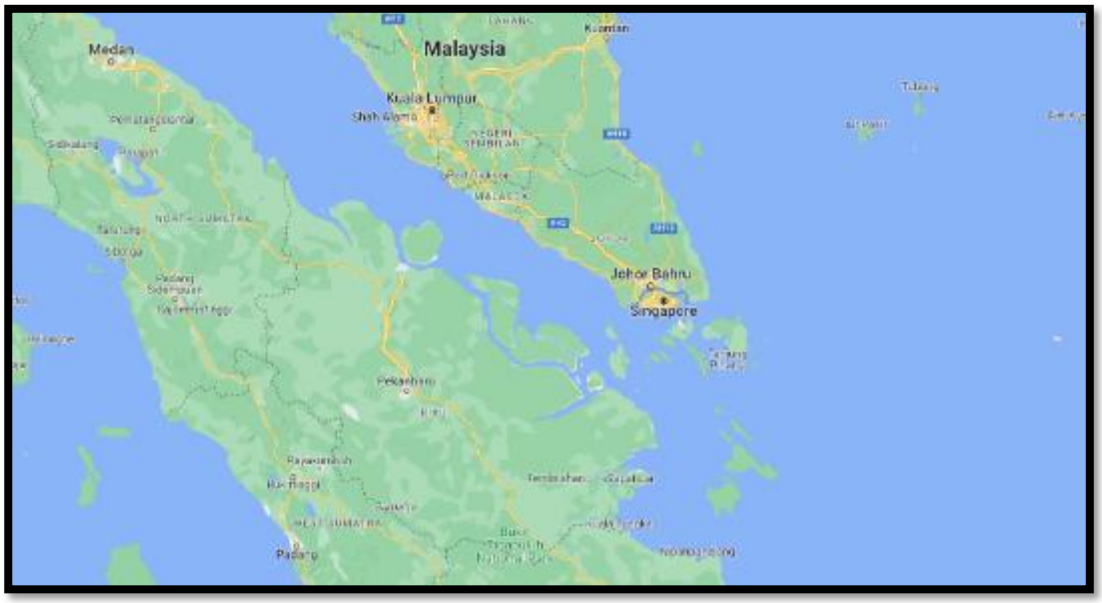

Figure 4. Map of Riau Province with its strategic location (Source: Google Map)

Unfortunately, these occurrences have far-reaching consequences, with neighboring countries (Agiesta, 2019; W. Dennis, 2015; The Straits Times, 2019),such as Malaysia and Singapore, experiencing significant haze levels due to the fires. The disruptions to various activities, including the closure of schools and airports, highlight the need for robust and effective measures to prevent and manage these incidents. The severity of the 2015 and 2019 fires in Riau Province is a poignant reminder of Indonesia's urgent need for improved forest and land fires management strategies. Due to its tropical climate, characterized by protracted dry seasons and arid conditions, the Riau region is highly susceptible to forest and land fires. However, natural factors are not the only contributors to this issue. Human activities such as land conversion through burning to expand plantation areas or engaging in other unlawful practices, such as clearing land for oil palm plantations, play a substantial role in causing forest and land fires in Riau. In Riau Province, the quantity of land devoted to plantations, particularly oil palm plantations, has increased dramatically in recent years, increasing the risk of forest

and land fires. This trend is supported by the fact that Riau Province has the largest area of oil palm plantations in Indonesia, at 2,86 million hectares, or 19,55 percent of the total national area of oil palm plantations (Badan Pusat Statistik, 2021).

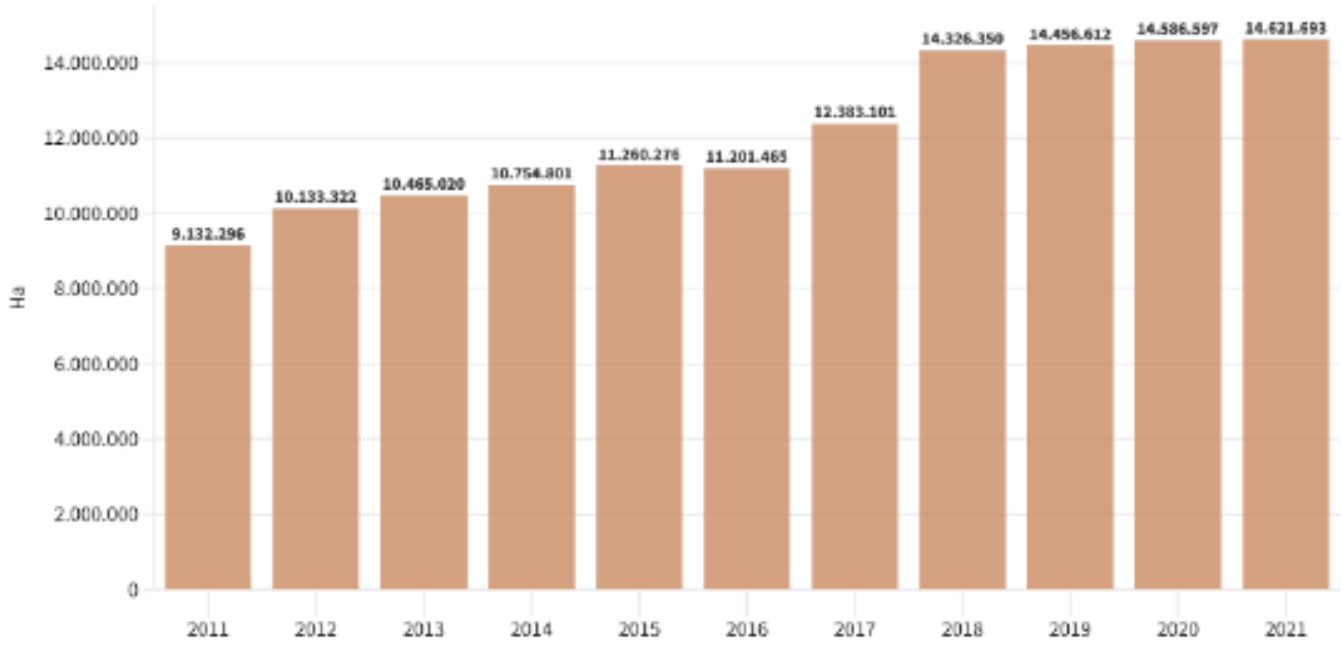

Figure 5. Oil palm plantation area in Indonesia 2011-2021 (Source: Badan Pusat Statistik)

Table 3. Oil palm plantation area in Riau Province 2011-2021 ***(Source: Badan Pusat Statistik)***

Year	Oil palm plantation area (in hectares)
2011	1.919.028
2012	2.139.824
2013	2.193.721
2014	2.290.736
2015	2.400.876
2016	2.012.951
2017	2.209.752
2018	2.706.892
2019	2.741.621
2020	2.862.132
2021	2.858.173

Figure 5 depicts the dynamic transformation of oil palm plantations in Indonesia from 2011 to 2021, utilizing data from the Central Bureau of Statistics. The graph clearly illustrates a consistent upward trend, depicting a continuous expansion of oil palm plantations over time. Nevertheless, the most alarming observation emerged from 2016 to 2017, as the region encompassing these plantations witnessed a remarkable increase of approximately 2 million hectares. The observed substantial and sudden rise in numbers strongly indicates the transformation of forested areas into oil palm plantations, potentially facilitated by land clearing methods such as burning.

Table 3 presents significant supplementary data, specifically emphasizing Riau Province, which has experienced notable increases in the extent of oil palm plantations. The data shows that forests are experiencing unprecedented levels of destruction to make way for the expansion of oil palm cultivation. In addition to its immediate implications, the trend of deforestation gives rise to more serious concerns regarding the potential environmental repercussions. Among the issues that have been identified is the loss of natural habitats for wildlife, which has resulted in a decline in biodiversity, as well as an increase in greenhouse gas emissions because of carbon release from the areas that have been cleared.

The assertion that forests and land for palm oil plantations in the province of Riau are firmly linked to forest and land fires is supported by substantial scientific evidence. Adrianto et al. (2019) explain in their study that there is a strong correlation between forest cover loss and fires, with the establishment of palm oil plantations being a key factor. Similarly, Tyson et al. (2018) explain how high-resolution satellite imagery proves that Indonesia's fire and haze crises are associated with agricultural expansion and land clearance for palm oil and acacia plantations. In addition, Saputra (2019) explains that in the province of Riau, the land is commonly cleared for palm oil plantations by fire, particularly on degraded peatlands.

Then, the results of my interviews with several informants from the local government and community leaders also said the same thing and strengthened the various findings that had been made.

Mr. Dwiyana (2022), a Functional Officer from the Riau Province Environment and Forestry Service, said that.

> "The massive expansion of oil palm plantations has made many people want to plant oil palm immediately. With limited capital, they use an easy and inexpensive way to clear land: burning the forest/land. There is no problem if the community or company wants to establish an oil palm plantation if all the requirements have been met and the government has obtained permission. The problem is, usually, these land burners are illegal."

In line with Mr. Dwiyana, Mr. Budi Hidayat (2022), the head of the Kampar Kiri Forest management unit, also expressed the same.

> "Most of the forest and land burning is caused by people who want to plant oil palm illegally. Usually, when a legal oil palm plantation meets certain requirements and gets a permit from the government."

Mr. Jhonny Mundung (2022) also said something similar.

> "Humans can already ascertain the cause of the forest fires. These humans only want to profit because they burn forests and land by burning. This is dangerous and can cause devastating land and forest fires like 2015 and 2019".

The present study thoroughly examines diverse research studies and interviews, leading to a robust assertion that the prevalence of forest fires in Riau Province is primarily attributable to human activities, with natural factors assuming a subordinate role. The collective findings elucidate the significant influence exerted by human activities on the occurrence and severity of these fires.

The study's findings emphasize the significance of the human element in forest fires in the region. This includes factors such as land clearing practices, slash-and-

burn agriculture, and the expansion of oil palm plantations. The escalation in the need for agricultural land and resources has resulted in widespread deforestation, thereby creating favorable conditions for the initiation and propagation of fires. Although fire outbreaks can be influenced by natural factors such as weather conditions and occasional lightning strikes, the impact of human activity on these incidents is considerably more significant. The risk of fire is significantly heightened by human actions and decisions, particularly when coupled with the presence of flammable materials and conditions that are prone to drought.

After exploring the factors that contribute to forest and land fires in Indonesia, it becomes clear that the main trigger for these fires is humans. El Nino or severe drought, although acting as a significant trigger, does not represent the root of the problem. In turn, this creates favorable conditions for arsonists to start and spread fires.

Dwiyana (2022), a functional officer of the Riau province environmental and forestry service, said:

> “The perpetrators of this arson were individuals from the community and society. There are also individuals, but it is not in their interests to clear agricultural land, but several companies give them money to burn forests and land. The burning method is the cheapest and fastest if done during the dry season or even El Nino. The fire will easily burn all the vegetation on the land."

Meanwhile, Made (2022), Executive Director of Jikalahari, said:

> “Many companies are involved as perpetrators of forest and land burning. We know because, based on our various findings in the field and those carried out by other NGO friends, it is also similar. "Frequently, forest and land fires occur on plantation company concessions, especially oil palm plantations owned by various companies, both small and large."

Based on these insights and supported by direct experience and field observations, the leading causes of this problem appear to be residents and companies interested in

clearing land for various purposes. Current trends show that commercial enterprises mainly trigger large-scale fires. When it comes to individual actors, their actions tend to occur on a smaller scale and impact a limited area. However, it is essential to emphasize that this in no way justifies such action, as these seemingly small fires can quickly escalate and spread to surrounding areas, driven by factors such as wind and other environmental conditions.

In this section, A summary of data regarding forest and land fire offenders in Riau Province will be presented, emphasizing the stormy year of 2015, which marked the highest number of forest and land fires in the preceding decade.

Table 6. Data showing massive forest and land fires in the areas of forestry companies and oil palm plantations in 2015 (Source: Eyes on the Forest, 2015)

Data on the number of hotspots in Riau Province during forest and land fires in July-October 2015					
Distribution of hotspots in the Company's Concession area	Total				
	July	August	September	October	Total
Forestry Company (Industrial Plantation Forest)	621	230	388	88	1327
Oil Palm Plantation Company	458	166	308	86	1018

The data presented above (table 6) highlights the extensive forest and land fires destroying the company's concession areas, which the government officially approves for their stated purposes. Urgent concerns arise as these companies are increasingly seen as deliberately burning their land for specific purposes or failing in their responsibility to protect their concession areas from fire.

A table will be provided to demonstrate field findings that confirm this claim, offering additional proof that these enterprises were either intentionally involved in igniting fires or careless in upholding fire-free concession zones in Riau. This

additional evidence underscores the importance of addressing this issue and holding those responsible accountable for these fires' devastating impacts.

Table 7. Findings on the ground related to forest and land fires in the company's concession areas (Source: Extracted from Eyes on Forest (2015))

No	Findings on the ground related to forest and land fires in the company's concession areas
1.	Young oil palm trees were allegedly burned because they were thought to be less productive.
2.	The opening of a new road through the concession shortly after the fire
3.	The finding of wood debris as incendiary material shows the alleged element of intentionality.
4.	Creation of small trenches (1 - 1.5 meters) as a barrier to the flow of fire from targeted blocks to blocks that are deliberately prevented from burning
5.	The existence of heavy equipment operations while the smoke was still billowing and immediately after the fire happened
6.	Land clearing subtly removes any trace of the burnt area, but there are still indications that the area has recently burned.
7.	The finding of oil palm seedlings near the burnt concession site suggests preparation for planting seedlings in the newly arrived area. Preparation for planting seedlings in the freshly burned area is suspected to have an element of deliberate arson. Intentionality in the burning

The findings detailed in Table 7 above provide an exciting narrative, clearly explaining that forest and land fires within forestry and palm oil company concession areas have apparent similarities, namely deliberate or, at the very least, an alarming level of negligence.

Concerns are growing around the environmental commitments and practices of two leading companies operating in Riau, Asia Pulp & Paper Company (APP) and APRIL, with particular focus on their alleged involvement in land burning. APP, as stated explicitly on its official website, implements a strict anti-burning policy on its land and promises to sever ties with suppliers engaging in similar practices. Apart from that, they are also committed to supporting low-emission development plans in Indonesia by emphasizing the protection of peatland forests as an effort to reduce

greenhouse gas emissions. However, what is confusing is that the 2015 Eyes on Forest report revealed that forest fires are still occurring, in direct conflict with their low emissions commitments. These findings have raised clear concerns about the adequacy of APP's actions against suppliers suspected or proven to be involved in land burning, casting a shadow over the company's seriousness in upholding its commitments (see Table 8).

APRIL, a leading industry player, also upholds a strict “No Burn” policy and high compliance with national legal requirements to address fire-related impacts. In line with APP, allegations indicate that APRIL has not effectively enforced its “No Burn” policy, where suppliers purportedly set deliberate fires, particularly in acacia plantations, before starting new plantings. These alleged violations raise doubts about APRIL's ability to keep its promises, highlighting the gap between stated commitments and practical actions. It is noteworthy that these two giant companies do not burn directly in their concession areas, but they source wood from partner companies that, based on findings from Forest (2015), are involved in this practice.

This problem goes beyond these companies and extends to the palm oil industry, which is now under intense scrutiny. Despite the ban on burning in the palm oil industry, disturbing evidence has emerged showing that oil palm seedlings and young oil palms are being planted after land burning. These practices appear to conflict with applicable regulations and principles regarding forest and land fires, especially those relating to peatlands, as outlined by influential organizations such as the Roundtable on Sustainable Palm Oil (RSPO), Indonesian Sustainable Palm Oil (ISPO), the Indonesian Palm Oil Pledge (IPOP), and the Ministry of Agriculture. A persistent concern is that these principles require effective implementation on the ground, not just documentation, to comprehensively stop land burning and ensure the implementation of sustainable practices in the palm oil industry.

Table 8. Relationships/affiliations of buyers and sellers of industrial timber for the pulp and paper industry (Source: Eyes on Forest (2015))

No	Large Group (buyers)	Supplier Company (Seller)
1.	APRIL GROUP	CV Putri Lindung Bulan
		KUD Bina Jaya Langgam
		PT. Bukit Batabuh Sei. Indah
		PT. Bukit Raya Pelalawan
		PT. Citra Sumber Sejahtera
		PT. Hutani Sola Lestari
		PT. Nusa Prima Manunggal (RGMS)
		PT. Rimba Lazuardi
		PT. Rimba Rokan Perkasa
		PT. Sumatera Riang Lestari - Blok IV (Rupat
		PT. Sumatera Riang Lestari - Blok VI (Bayas Kerumutan)
		PT. Rimba Rokan Lestari
2.	Asia Pulp and Paper (APP) (Part of Sinar Mas Group)	PT. Arara Abadi
		PT. Ruas Utama Jaya,
		PT. Satria Perkasa Agung,
		PT. Bina Duta Laksana

Table 9. Relationships/affiliations of buyers and sellers of oil palm plantation (Source: Eyes on Forest (2015))

No	Large Group (buyers)	Supplier Company (Seller)
1.	Asian Agri	PT Pusaka Megah Bumi Nusantara
2.	Provident Agro, Wilmar International (CPO)	PT Langgam Inti Hibrindo
3.	Darmex Agro	PT Bertuah Aneka Yasa
4.	First Resources	PT Setia Agro Lestari
5.	Tabungan Haji Bhd	PT Bumi Reksa Nusa Sejati
6.	Musim Mas (CPO), First Resources	PT Panca Surya Agrindo
7.	Peputra Masterindo	PT Peputra Supra Jaya
8.	Sambu Group	PT Agroraya Gematrans
		PT Guntung Hasrat Makmur
9.	No/unknown affiliation	PT Nirmala

	PT Alam Sari Lestari
	PT Duet Rija
	PT Parawira Group
	PT Runggu Prima Jaya
	PT Teso Indah

As highlighted by Professor Bambang Hero Saharjo from the Bogor Agricultural Institute in the Eyes on Forest report of 2015,

> "The burning of land does not incur any losses for the company; in fact, it yields economic benefits. Through land burning, companies eliminate the need to purchase lime to raise peat pH and the expenses of acquiring fertilizers for nourishment, as these costs are replaced by the ash and charcoal residue from the fires. Furthermore, this practice reduces expenses such as labor wages, fuel, and other operational necessities." This economic motivation, as explained by the professor, offers a clear incentive for supplier companies to engage in land-burning practices.

Table 9 delineates the intricate web of relationships and affiliations within large conglomerates operating in the palm oil industry, both in their final product form and as Crude Palm Oil (CPO) suppliers. Notably, it reveals that many companies supply palm fruit to these significant entities. Yet, the disturbing revelation is that many of these suppliers persist in land-burning practices, which, in turn, contribute to the recurrent and extensive forest and land fire disasters witnessed annually.

3. Research Methods

3.1 Research Design

This research adopts a case study method included in the qualitative research cluster (Yazan & De Vasconcelos, 2016). Regarding case studies in qualitative research, Yin (1989) argues that a case study is a unique, special, or exciting story. This case story can focus on an individual, organization, process, environment, institution, or surrounding event (Vanwynsberghe & Khan, 2007; Woodside & Wilson, 2003). The primary objective of this case study design is to provide an in-depth understanding and explanation of why intriguing or noteworthy occurrences take place, how they are executed, and what outcomes result from these noteworthy occurrences (Vanwynsberghe & Khan, 2007).

Referring to Blatter & Haverland (2012), Single case studies are classified, each entailing an in-depth investigation of an individual instance to gain a profound understanding of a certain phenomenon. Although it only involves one case, it focuses on a detailed understanding and exploration of causality in a particular context. The elaboration of a single case study in the context of multi-stakeholder collaboration for forest and land fire control in Indonesia, especially in Riau Province, will focus on an in-depth study of one particular context. This research focuses on Indonesia, where multi-stakeholder collaboration in forest fire control occurs. However, in addition to examining cases in Indonesia in general, this research will then focus on how multi-stakeholder collaboration in forest and land fire control in Riau Province is the primary locus of this research.

The research in Designing Case Studies by Blatter & Haverland (2012) is suitable for Causal-Process Tracing (CPT), a method that explores the development of a causal process from start to finish in a single case. Beach & Pedersen (2016)is called Process Tracing (PT). This study, focusing on multi-stakeholder engagement in Riau Province, aims to understand the internal

mechanisms of collaboration, participant roles, interaction dynamics, challenges, and decision-making processes. CPT will help trace the events and decisions leading to forest and land fire control outcomes.

3.2 Case Selection

Indonesia is one of the tropical countries with the largest forest and land fires in the world (Achyar et al., 2015; Alisjahbana & Busch, 2017; M. Arifin, 2019; Astuti, 2020; S. Edwards & Heiduk, 2015; Fatah, 2010; H. Purnomo et al., 2017b, 2019; Rosul, 2015; Tacconi & Vayda, 2006). Indonesia, which should be the leading actor in saving the world from global warming, reflects the opposite. Not only that, but forest and land fires in Indonesia have also caused a smog disaster that has caused tremendous losses in the economy and public health (Astuti, 2020; S. A. Edwards & Heiduk, 2015; S. Edwards & Heiduk, 2015; Hansson & Dargusch, 2018; Koalisi Anti Mafia Hutan, 2019; H. Purnomo et al., 2017b, 2019; Puspitaloka et al., 2020). Forest and land fires in Indonesia are not a straightforward way to resolve because, since 1998, they have continued to occur until 2021 (Alisjahbana & Busch, 2017). Even the worst forest and land fires occurred in 2015, with an estimated economic loss of USD 16.1 billion, and that does not include the negative impact on the health of millions of people affected by the haze caused by forest and land fires (Adriani et al., 2016).

The case selection procedure is essential in research because it directly affects the validity and generalizability of the results obtained (Gerring & Cojocaru, 2016). Gerring & Cojocaru (2016) explain the techniques and limitations of case selection, especially in case study research. The approach used for case selection in this study is declared as an extreme case (Gerring, 2007; Seawright & Gerring, 2008). Extreme cases demonstrate extraordinary or extreme features in a particular phenomenon being studied. Single-N extreme case studies provide in-depth insight into a single, exceptional case, illuminating the complexity of an extreme situation. These cases are selected because of their unusual intensity or magnitude. This

allows researchers to understand better the mechanisms or causal elements that are more evident in severe circumstances. Factors that support selecting these case studies as extreme examples include their appropriateness to highlight the constraints, complexity, and magnitude of a significant problem that demands extraordinary collaborative efforts. The forest and land fires in Indonesia that have occurred worldwide, mainly because of their transboundary consequences, make them valuable extreme cases for gaining a deeper understanding of the effectiveness or ineffectiveness of collaboration in highly demanding situations.

The selection of extreme cases in this study is based on the magnitude of the forest and land fires that occurred, along with their substantial impacts on several dimensions, including environmental, economic, social, health, and international consequences. Extreme situations often offer a situational framework highlighting multi-stakeholder cooperation's constraints or advantages. Major forest fires in Indonesia, such as those in 2015, affected the entire country and resulted in a regional disaster as the haze spread to neighboring countries such as Malaysia and Singapore. Effective crisis management requires increased collaboration among stakeholders, including the government, the commercial sector (especially plantation companies), non-governmental organizations (NGOs), and local communities. Extreme circumstances put the capacity for multi-stakeholder collaboration to the ultimate test.

Furthermore, Indonesia is a country that implements multi-actor cooperation to address this problem. Presidential Instruction Number 11 of 2015, Presidential Instruction Number 3 of 2020, and Regulation of the Minister of Environment and Forestry Number 11 of 2015 are laws and regulations that explicitly outline multi-stakeholder collaboration in the context of improving, preventing, and reducing forest and land fire control. The regulation related to forest and land fire control in the Republic of Indonesia is Regulation P.32/MENLHK/SETJEN/KUM.1/3/2016. Although the state (government) is not the only entity involved in forest and land

fire control, other sectors, including NGOs, local communities, and the corporate sector, also contribute to its management. Although this development is expected to be beneficial, forest and land fires continue to occur with high frequency, especially during the dry season. A strong reason exists for why forest and land fires in Indonesia were chosen as the research focus.

3.3 Research Location

This research was conducted in Indonesia by narrowing it down to study in one province, Riau Province. To get more precise and detailed data, This research focused on forest and land fires in Riau Province, the province with the largest forest and land fires area in Indonesia (Purba et al., 2022; Rosul, 2015; Saputra, 2019; Yusuf et al., 2019; Zainal et al., 2017). This enables the acquisition of more detailed data regarding Indonesia's forest and land fires. Notwithstanding the occurrence of forest and land fires in multiple Indonesian provinces, Riau Province is a preferable selection for my research for several reasons.

Firstly, the area has experienced numerous forest and land fires over an extended period. This indicates that current efforts to control such disasters must be revised and require coordinated action from various stakeholders. This presents an opportunity for me to conduct research and evaluate how collaborative governance can enhance forest and land fires management in Riau Province. Secondly, multiple parties partake in preventing forest fires in Riau Province, including local and national government agencies, plantation businesses, farmers, NGOs, and communities. This emphasizes the importance of collaboration amongst different parties in controlling forest and land fires. Therefore, the dynamics of this collaboration can be investigated and factors that support or hinder collaborative governance in forest fire management in Riau Province can be identified.

Riau Province's potential as a model for collaborative governance in forest and land fire management can benefit other Indonesian provinces. By undertaking a case study in Riau Province, we can learn from the experience of multi-actor collaboration and apply this knowledge across Indonesia. Consequently, the research can contribute to national collaborative governance development to manage forest and land fires effectively.

3.4 Data source

This research draws upon a combination of primary and secondary data sources. Primary data is meticulously garnered through in-depth interviews with semi-structured and direct field observations in alignment with established methodologies.In the case study methodology context, acquiring primary data through in-depth interviews is a cornerstone (Renz et al., 2018; Tellis, 1997; Wray et al., 2007). Furthermore, a fundamental tenet of the case study approach entails complementing interviews with firsthand field observations of actual events (Guion et al., 2002; Wray et al., 2007; Yazan & De Vasconcelos, 2016). The research design is augmented by secondary data from pertinent literature encompassing books, work reports, and other scholarly works pertaining to the research domain (Guion et al., 2002; Vanwynsberghe & Khan, 2007).

Table 4 Source of data used in this research.

Data source	Data Collection Technique	Description
Primary Data	In-depth interview	Conducting interviews with appointed informants
	Direct field observation	Go to locations around forest and land fires to see firsthand what is happening in the field.
Secondary Data	Work report document	Sourced from the central government, local governments, NGOs, and various other reports relevant to this research

News in print and online media	Paying close attention to various news related to forest and land fires
Documents Research related to forest and land fires	Collect and analyze research documents about forest and land fires

3.5 List of informants

I have spent six months (August 2022 – January 2023) conducting interviews with informants with expertise and experience in dealing with these challenges. This approach enables me to understand the current collaborative governance practices in managing forest and land fires and the challenges various stakeholders face.

This study was conducted through interviews with 20 informants, carefully selected based on their professional backgrounds and relevance to the topic. The group included government officials, community leaders, NGO representatives and the private sector. Of the 20 informants, 16 allowed their identities to be disclosed to the public, and 9 allowed them to be recorded. The other 4 informants did not allow their identities to be made public and did not allow the conversations to be recorded. At that time, only the essential elements from the interview were recorded, while all audio recordings and pertinent information were later incorporated into the dissertation's appendix. However, out of respect for privacy concerns, 4 additional informants did not permit the disclosure of their details to the public. Consequently, this information was kept confidential. To ensure inclusivity and an accurate representation of the research, all transcripts, field notes, and photographs relating to the interviews were meticulously collected and added to the dissertation. This approach yielded a comprehensive study that respected the anonymity of those who wished it.

These interviews were conducted in various locations across Indonesia, particularly in areas that have recently experienced significant forest and land

fires. These yielded first-hand information regarding the perspectives, experiences, and insights of important stakeholders engaged in the management of forest and land fires in Indonesia. The results of this study provide valuable scientific evidence to inform policymakers and practitioners seeking to enhance the collaborative governance framework for managing forest and land fires in Indonesia.

Table 5. List of informants

Name of The Institution	Name of The Department	Institution Background	Position of The Interviewee	Name of The Interviewee
Ministry of Environment and Forestry of the Republic of Indonesia (Kementerian LHK)	Manggala Agni in Riau Province (the agency in charge of fighting forest and land fires)	The central government agency	Manggala Agni Regional Coordinator in Riau Province	Edwin Putra
Peatland and Mangrove Restoration Agency of The Republic of Indonesia (BRGM)	Head of Agency	The central government agency	Head of Agency	Hartono
Peatland and Mangrove Restoration Agency of The Republic of Indonesia (BRGM)	Working Group in Riau Province	The central government agency	Head of Working Group in Riau Province	Sarjono Budi Subechi
National Research and Innovation Agency	Department of Development Policy	The central government agency	Head of Department	Mego Pinandito
Environment and Forestry Service of Riau Province	Forest Fire Management Section	The Provincial Government agency	Functional official	Dwiyana

Governor of Riau Province	Expert Staff of Riau Governor	The Provincial Government agency	Expert for the Governor of Riau on Environment and Forestry	Jhonny Mundung
Environment and Forestry Service of Riau Province	Forest Management Unit Kampar Kiri Hilir	The Provincial Government agency	Head of Kampar Kiri Hilir Management Unit Office	Budi Hidayat
Environment and Forestry Service of Riau Province	Forest Management Unit Kampar Kiri Hilir	The Provincial Government agency	Head of Section	Doni
Environment and Forestry Service of Riau Province	Forest Management Unit Kampar Kiri Hilir	The Provincial Government agency	Head of Section	Dedy
Regional Disaster Management Agency of Riau Province	Head of Agency	The Provincial Government agency	Head of Agency	Edy Afrizal
Indonesian Forum for the Environment (WALHI Riau)	Director	National NGO	Director	Boy Jerry Even Sembiring
Riau Forest Conservation Network (Jikalahari)	Director	Local NGO	Director	Made Ali
Riau Andalan Pulp and Paper (RAPP APRIL GROUP)	Forest Fire Fighting Unit	Private Sector	Head of Unit	Yuneldi
Riau Andalan Pulp and Paper (RAPP APRIL GROUP)	Fire Fighting Department	Private Sector	Head of Department	Mr. Ian
Riau Andalan Pulp and Paper (RAPP APRIL GROUP)	Forest Fire Fighting Unit	Private Sector	Staff	Fuad

Riau Andalan Pulp and Paper (RAPP APRIL GROUP)	Estate Pelalawan	Private Sector	Fire Fighting Coordinator in Estate Pelalawan	Ridho

3.6 Data analysis techniques

In qualitative research, data analysis techniques are a crucial step to gaining a deep understanding and accurate interpretation of the collected data. In this study, semi-structured interviews were used as the primary method to gather information from informants (Guion et al., 2002; Leech & Onwuegbuzie, 2007; Renz et al., 2018). This interview technique allows flexibility in the formulation and development of questions so that researchers can direct the discussion based on the informant's responses and the situation that develops during the interview. The following are the stages of data analysis carried out in this study (see figure 6):

1. Interviews with Stakeholders Conducted

   In this study, semi-structured interviews were conducted with various stakeholders, including government agencies, non-governmental organizations, local communities, and the private sector. These interviews were intended to identify the perspectives, roles, and contributions of each party in controlling forest and land fires. The use of semi-structured techniques allows for flexible and in-depth exploration of stakeholder views.
2. Interview Transcriptions Created

   After the interviews were completed, complete transcriptions were created to ensure the accuracy of the data obtained. This transcription process allows for a detailed review of the conversations and ensures that the perspectives of all stakeholders are represented in subsequent analysis.
3. Data Coded and Categorized Based on Collaboration Themes

At this stage, the transcribed data were coded according to themes relevant to the collaboration, such as stakeholder communication, division of roles and responsibilities, resource support, and challenges and constraints. In addition, arguments were classified to indicate each party's stance (e.g., supportive, neutral, or opposed) toward the collaborative steps being taken.

4. Data Triangulated with Observations and Supporting Documents

   To increase the validity of the findings, interview data were verified through triangulation with field observations and relevant documentation, such as annual reports, government policies, and organizational activity records. This triangulation was conducted to ensure that the perspectives gathered from the interviews were in line with the reality on the ground and supported by secondary sources.

5. Conclusions Drawn and Dissertation Compiled

   Based on the analysis and triangulation, conclusions regarding the effectiveness of multi-stakeholder collaboration in controlling forest and land fires were drawn. These conclusions include the identification of successful collaboration patterns, areas for improvement, and recommendations for future policies. These findings are systematically compiled in the dissertation to inform and contribute to the development of collaborative strategies for controlling forest and land fires in Indonesia.

This study employs a thorough data analytic technique that provides a solid foundation for assessing and improving multi-stakeholder collaboration in the management of forest and land fires in Indonesia. This study employs a meticulous process involving stakeholder interviews, transcription, coding, and rigorous triangulation with field observations and supporting documents to ensure accurate representation and systematic analysis of each stakeholder group's voices and perspectives. This process enhanced the reliability and validity of the findings while offering a multi-faceted perspective on the collaborative dynamics among

stakeholders, emphasizing both the triumphs and challenges within the current fire management frameworks.

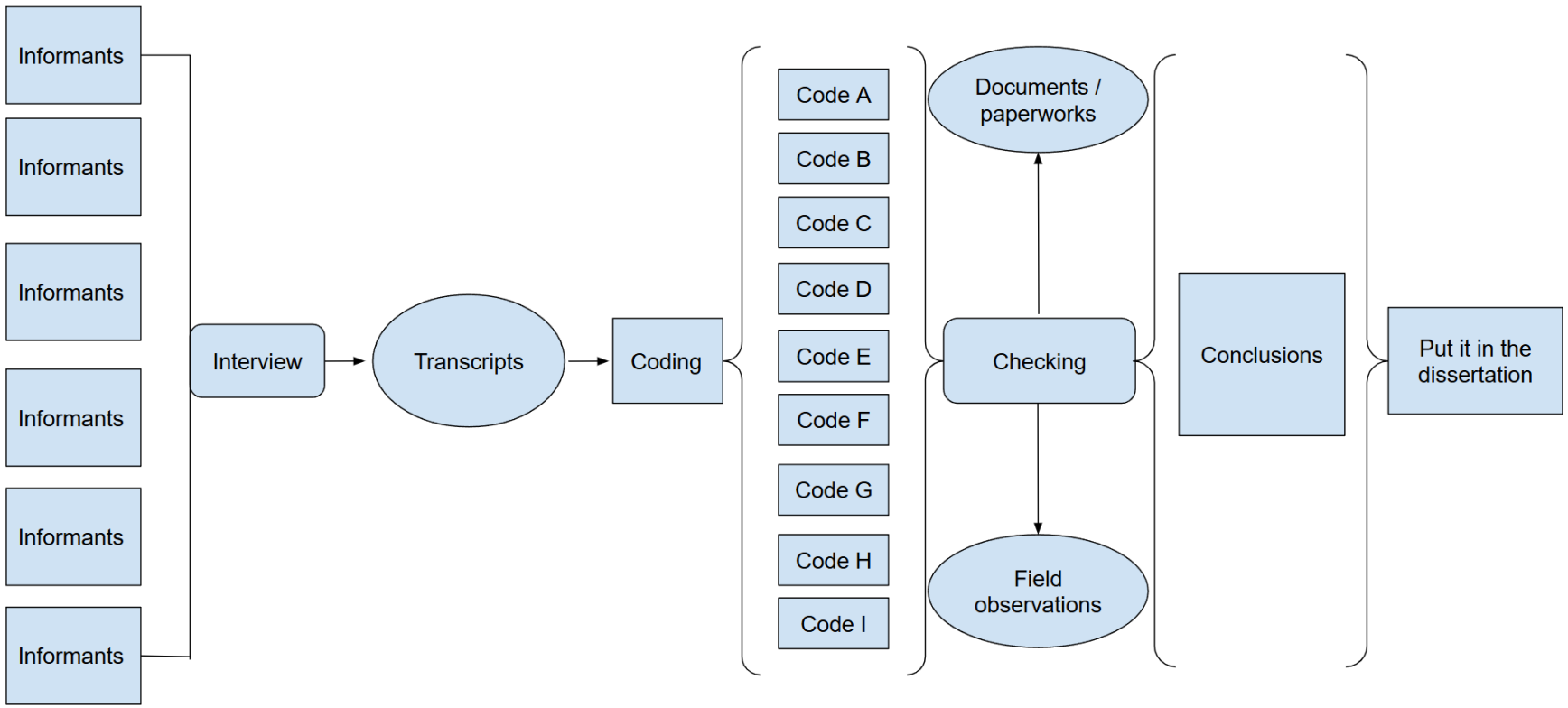

Figure 6. Data analysis technique (my own synthesis)

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4. Implementation of Collaborative Governance in Forest and Land Fire Control in Indonesia

4.1 Introduction

The fourth chapter of this research study is devoted explicitly to RQ1, " How has collaborative governance been implemented in forest and land fire control in Indonesia?" This chapter discusses the implementation of collaborative governance in handling forest and land fires in Indonesia, focusing on Riau Province. It begins by providing an in-depth exploration of the national and provincial regulations that underpin a collaborative governance framework. Furthermore, this chapter examines the key actors and stakeholders involved in multi-stakeholder collaboration at national and provincial levels, highlighting their essential role in shaping policy and strategy.

Moving forward, this chapter undertakes a comprehensive analysis of the evolution and occurrence of collaborative governance in Indonesia and Riau, examining the factors that facilitate or hinder their successful implementation. An essential aspect of this study revolves around explaining key collaborative processes, decision-making mechanisms, and resulting outcomes. By understanding the intricacies of collaborative efforts, readers will gain valuable insight into the methods used to achieve collective goals and objectives. Furthermore, the chapter analyzes three components influencing the collaborative process: initial conditions, institutional design and facilitative leadership.

In closing, this chapter summarizes the collective findings and experiences, emphasizing the transformative potential of collaborative governance in effectively managing forest and land fires in Indonesia and Riau Province. Collaborative governance is emerging as a critical strategy to promote environmental sustainability and resilience by fostering cooperation among multiple stakeholders and drawing lessons learned.

4.2 Regulations related to collaborative governance in forest and land fires control.

The Indonesian government stressed the significance of the role played by different stakeholders in mitigating forest and land fires in the wake of the enormous forest and land fires in 2015 that consumed around 2.6 million hectares of forest and land. The government enlists non-governmental actors, including communities, the commercial sector, and other groups, to prevent and control forest and land fires. According to the appropriate government officials, collaboration among stakeholders is essential for reducing the impact of forest and land fires. The Indonesian government has enacted several regulations at the national and local levels that underline the significance of cooperation between various parties in tackling the forest fire problem. The "collaborative governance" idea, which underscored the importance of incorporating non-governmental forces in solving public issues, is in keeping with these regulations.

There are at least a few laws governing multi-actor collaboration in preventing forest and land fires at the national level:

No	Regulations	Description
1.	Law No 41 the Year 1999 on Forestry	This regulation is the primary regulation governing forestry in Indonesia. One of the critical points is that non-government elements, namely Private sector forestry companies authorized to manage forest areas by the government, must be responsible for preventing and controlling forest and land fires in their regions.
2.	Presidential Instruction No. 11/2015 on Improving Forest and Land Fire Control	This Presidential Instruction directs local governments, the Indonesian National Defense Forces (TNI), and the Indonesian National Police (POLRI) to cooperate in controlling forest and ground fires and involve communities and the private sector in prevention and suppression efforts.

3.	Minister of Environment and Forestry Regulation No. P.32/MENLHK/SETJEN/KUM.1/6/2016	This regulation regulates the duties and responsibilities of local governments, the Indonesian National Armed Forces (TNI), the Indonesian National Police (POLRI), business license holders, and communities in controlling forest and land fires. This regulation is the primary reference for collaboration in forest and land fire control at the national level.
4.	Presidential Instruction No. 3 of 2020 on forest and land fire prevention.	This regulation describes strengthening coordination between government agencies at the central and regional levels in dealing with forest and land fires in Indonesia.

Table 6. Regulations regarding multi-actor collaboration in preventing forest and land fires at the National level.

These four regulations create a necessary legal framework at the national level that emphasizes the importance of handling forest fire cases in Indonesia through a collaborative approach. Multi-stakeholder or multi-actor collaboration is needed to solve the problem of forest and land fires more efficiently and effectively. In this context, multi-actor collaboration involves the central and local governments, TNI, POLRI, the private sector, communities, and non-governmental organizations. By working together, these parties can complement each other and optimize their resources to comprehensively address forest and land fires. In addition, this collaboration will enable a better exchange of information, knowledge, and experience to improve the capacity and quality of forest fire management in Indonesia.

No.	Regulations	Description
1.	Regional Regulation of Riau Province Number 1 of 2019 concerning Technical Guidelines for Forest and Land Fire Management.	This regulation contains technical details of forest and land fire control in Riau, including the active involvement of non-government elements such as communities, NGOs, private companies, academics, and various other relevant stakeholders. This regulation has become the central legal umbrella in controlling forest and land fires in Riau Province since 2019.

2.	Governor Regulation of Riau Province Number 9 of 2020 concerning Standing Procedures for Criteria for Determining the Status of Disaster Emergencies and Command of the Land and Forest Fire Control Task Force in Riau Province	This regulation contains two important things related to forest and land fire control in Riau Province. The first concerns the criteria for determining land and forest fire disaster status based on specific standards in detail in this regulation. The second is regarding the formation of a joint forum called the Riau Province Forest and Land Fire Control Task Force, where this forum is a collaboration and coordination node for all government and non-government stakeholders related to forest and land fire control. This forum is vital considering that all critical decisions and the implementation of decisions related to forest and land fire control come from the forest and land fire task force.

Table 7. Regulation regarding multi-actor collaboration in forest and land fire control at Riau Province.

These two regulations are essential technical rules in establishing the legal framework for forest and land fire control in Riau, which specifically emphasizes the active involvement of non-government elements. These regulations ensure effective coordination and collaboration between various stakeholders, including communities, non-governmental organizations, the private sector, and academia, in addressing the province's forest and land fire problem. As such, it helps to create an inclusive and holistic forest and ground fire control strategy, combining multiple perspectives and resources to address this complex challenge effectively.

4.3 Stakeholders controlling forest and land fires in Indonesia and Riau Province, who are they?

It is essential to understand the stakeholders/actors involved in controlling forest and land fires in Indonesia, especially at the national level. At the national level, various stakeholders, such as the central government, national agencies, and organizations, are responsible for addressing forest and land fires throughout

Indonesia. Thus, in the context of controlling forest and land fires in Indonesia, these national stakeholders have an essential role in handling all cases of fires throughout Indonesia.

Regarding the actors involved in the multi-actor collaboration in forest fire control, it is essential to know the extent of their involvement in forest fire control. Based on the results of my research, the following are stakeholders in multi-actor collaboration in forest fire control in Indonesia[2].

No.	Stakeholder Name	Background	Description
1.	Ministry of Environment and Forestry	Central Government	A government institution is fully responsible for all matters related to the forestry sector. It is the primary institution handling the issue of forest and land fires in Indonesia.
2.	National Disaster Management Agency (BNPB)	Central Government	A government agency in charge of disaster management in Indonesia. Forest and land fires are categorized as disasters, so BNPB is Indonesia's main agency dealing with forest and land fires. It is also the coordinator for forest and land fire control in Indonesia.
3.	Indonesian National Army (TNI)	Central Government	Military institutions in Indonesia have the primary function in the defense sector. However, regarding forest and land fires, it was ordered by the President of Indonesia to carry out military operations other than war, namely to help control forest and land fires.

[2] For more details, see appendix 3

4.	Indonesian National Police (POLRI)	Central Government	An institution whose primary function is security and law enforcement. The President of Indonesia directly ordered me to collaborate with other institutions in controlling forest and land fires in Indonesia.
5.	Peat and Mangrove Restoration Agency (BRGM)	Central Government	An institution primarily tasked with planning and implementing the restoration of damaged peatlands and mangroves. Damaged peatlands are one of Indonesia's leading forest and land violence sources.
6.	National Research and Innovation Agency (BRIN)	Central Government	The new institution is a combination of several institutions, such as the Agency for the Assessment and Application of Technology (BPPT), the Indonesian Institute of Sciences (LIPI), the National Institute of Aeronautics and Space (LAPAN), and the National Nuclear Energy Agency (BATAN). BPPT (now BRIN) contributes to applying Weather Modification Technology (TMC), which is very useful for extinguishing forest and land fires.
7.	Meteorology Climatology and Geophysics Agency (BMKG)	Central Government	This institution has main tasks in meteorology, climatology, air quality, and geophysics. This institution supports providing data related to weather and climate, which are closely related to forest and land fires.

8.	Ministry of Agriculture	Central Government	The institution that has the main task in agriculture in Indonesia. This institution has authority in the plantation sector, which is related to fires that often occur on agricultural land or plantations (for example, oil palm plantations).
9.	NGO	NGO	National NGOs play an essential role in controlling forest and land fires. NGOs such as WALHI Nasional, Yayasan Konservasi Alam Nusantara (YKAN), Yayasan Kemitraan, etc., have contributed positively to the control of forest and land fires in Indonesia.
10.	Companies in Forestry and Plantation	Private Sector	Companies in the forestry and plantation sectors must undoubtedly play an active role in controlling forest and land fires. Companies must at least eliminate forest and land fires in their areas.

Table 8. Actors/stakeholders involved in forest and land fires control collaboration in Indonesia - National Level.

After understanding the national-level stakeholders involved in collaborative land and forest fire management in Indonesia, examining collaboration at the provincial level, specifically in Riau Province, is crucial. This research concentrates on Riau Province, the most fire-prone province in Indonesia, with forest and land fires occurring annually. This section will, therefore, provide a detailed explanation of the function of each stakeholder involved in forest and land fire control in Riau Province.

Upon concluding the research, which entailed direct data acquisition via comprehensive interviews with diverse stakeholders, a profound comprehension of collaborative initiatives in forest and land fire management in Riau Province was

attained. As a result, a variety of principal and ancillary players engaged in these management initiatives in Riau Province have been recognized[3].

No	Institution	Description
1.	Riau Province Land and Forest Fire Task Force (Forest and Land Fires Task Force)	It is a new organization formed as a node of collaboration and coordination in controlling forest and land fires in Riau Province. It comprises various government, private sector, NGOs, and community stakeholders.
2.	Riau Province Environment and Forestry Service	The provincial-level agency has particular authority in the field of environment and forestry. This office is one of the critical actors in controlling forest and land fires in Riau Province.
3.	Riau Provincial Disaster Management Agency	The agency is specifically responsible for disaster management in Riau Province. Since forest and land fires are considered a disaster, this agency plays an essential role in controlling forest and land fires.
4.	Manggala Agni of Riau Province	It is a central government agency under the Ministry of Environment and Forestry in Riau Province tasked explicitly with preventing and fighting forest and land fires.
5.	Indonesian Army - Wirabima Resort Military Command	The Indonesian Army, in this case, the Wirabima Resort Military Command, is one of the military structures in Riau Province. As a large organization with a structure up to the village called the Village Supervisory Officer (BABINSA), the Army is also one of the critical actors in controlling forest and land fires in Riau Province.
6.	Air Force - Roesmin Nurjadin Air Base	The Air Force is one of the military structures located in Riau Province. Roesmin Noerjadin Air Base is one of the crucial organs in controlling forest and land fires, especially in carrying out air operations.

[3] For more details, see appendix 4

7.	Indonesian National Police - Riau Regional Police	Riau Regional Police is one of the security institutions in Riau province. Like the Indonesian Army, Riau Police also has a large structure down to the village level called Bhayangkara Pembina Keamanan dan Keteriban Masyarakat (Bhabinkamtibmas). This institution plays a significant role in controlling forest fires in Riau province.
8.	Forest Management Unit (FMU)	It is an organization owned by the Riau Province Environment and Forestry Service at the site level. There are 13 FMUs in Riau Province, which become the frontline to take care of various matters in the forestry sector, one of which is controlling forest and land fires in their respective regions.
9.	Riau Province Meteorology Climatology and Geophysics Agency (BMKG)	The Riau Meteorology Climatology and Geophysics Agency provides data on climate, weather, satellite data, and other vital data to support efforts to control forest and land fires in Riau Province.
10.	Riau Forest Protection Network (Jikalahari)	Jaringan Kerja Penyelaman Hutan Riau is an NGO that focuses on environmental and forestry issues in Riau Province. Jikalahari controls forest and land fires in Riau with various efforts such as advocacy, campaigns, socialization, and other positive things.
11.	Wahana Lingkungan Hidup Riau (Walhi Riau)	Wahana Lingkungan Hidup Riau is an NGO that is very actively involved in the issue of forest and land fires in Riau Province. Walhi is active in policy advocacy, research, campaigning, and socialization efforts related to the issue of forest and land fires in Riau Province.
12.	April GROUP (RAPP Firefighter)	The RAPP Firefighter Department is PT RAPP's specialized unit for controlling forest and land fires in PT RAPP's operating areas in Riau Province. On various occasions, the RAPP Firefighter department also assists in controlling forest and land fires in areas outside the company based on orders from the local government.

13.	Sinar Mas Firefighter	A specialized unit owned by the Sinar Mas Group to control forest and land fires in its area of operations. It is also ready to assist the government in controlling fires in other areas at the direction of the local government.
14.	Fire Awareness Community (MPA)	Fire Awareness Communities are community groups at the village level formed to prevent and extinguish forest and land fires in their respective areas. Fire awareness communities are one of Indonesia's front lines in controlling forest and land fires.

Table 9. Stakeholders involved in forest and land fire management efforts in Riau Province.

In controlling forest and land fires, stakeholders at the central level also coordinate with stakeholders at the provincial level. Likewise, the provincial level went downward so that there was a synergy between forest and land fire control institutions.

4.5 Unpacking the Stakeholders: Roles and Interests in Collaborative Forest and Land Fire Management in Indonesia

After understanding the roles and interests of the various actors involved in controlling forest and land fires in Indonesia, it is essential to thoroughly analyze each actor's responsibilities based on their background. They are actively involved in field operations, shaping and implementing the forest and land fire control strategy. Concerning collaborative governance (Ansell & Gash, 2008; Bradford, 2016; Emerson, 2015; Purdy, 2012), the Indonesian government invites various stakeholders to be equally involved in controlling forest and land fires in Indonesia. The realization of this is by always holding a coordination meeting on forest and land fire control in Indonesia, which is held sometime before the dry season comes. This coordination meeting is not only to prepare technical matters related to the prevention and extinguishing of forest and land fires but also to

strengthen the commitment of each stakeholder involved in controlling forest and land fires to solve this problem jointly.

According to Hartono (2022), the Head of the Peat and Mangrove Restoration Agency,

> "Every year, stakeholders involved in forest and land fire control in Indonesia are invited to the National Coordination Meeting for Forest and Land Fire Control. President Joko Widodo has directly conveyed his directives for us to collaborate according to our capabilities"

Similarly, Edwin (2022), the Coordinator of Manggala Agni Riau Province (MoEF), echoed this sentiment by stating,

> "Every year before the dry season comes, we are prepared to follow instructions from the central and provincial governments. At the central government level, there is always a coordination meeting which serves to equalize the collaboration of various stakeholders and strengthen their commitment to solving the problem together".

The Ministry of Environment and Forestry is the main stakeholder. It is the Ministry of Environment and Forestry that has full authority in the field of fires and vertically also has the right to coordinate various forest and land fire control policies up to the level of the fire service at the provincial level. The MoEF is responsible for forest and land fire management, while BNPB is responsible for disaster management, including fire emergencies. According to (Fisher et al., 2018), the MoEF has direct jurisdiction over Indonesia's forest areas and is responsible for identifying and classifying forests and land. They play an essential role in setting policies and regulations for forest and land fire management. BNPB coordinates and implements disaster management initiatives, such as fire emergencies (Fisher et al., 2019). However, by existing regulations and presidential directives, when a fire disaster occurs in Indonesia, BNPB as a disaster management stakeholder, takes over the command function to make it more systematic. Moreover, BNPB has equipped all the strengths for disaster

management of forest and land fires, such as personnel, tools, and all other needs already exist.

MoEF and BNPB collaborate in the context of forest and land fires to prevent, monitor and extinguish fires. MoEF's forest and land fires management organization, Manggala Agni, supervises fire prevention and implements fire suppression measures (Sitanggang et al., 2022b). As the coordinating agency for disaster management, BNPB provides assistance and resources for fire suppression efforts, including mobilizing firefighting teams and personnel (Sitanggang et al., 2022b). MoEF and BNPB must work together in responding to fire emergencies. BNPB provides MoEF logistical, personnel, and coordination support during fire suppression operations. They collaborate to develop strategies and action plans for fire prevention and suppression, drawing on the knowledge and resources of both organizations.

In addition, MoEF and BNPB collaborate on acquiring and analyzing forest and land fire data. MoEF collects data on fire-prone areas and analyzes the causes and characteristics of fires, which is necessary to develop effective fire suppression strategies (Hidayati et al., 2020). BNPB uses this information to evaluate the severity of fire emergencies and allocate necessary resources. These two institutions are the leading institutions in controlling forest and land fires in Indonesia.

According to Mr. Hartono (2022), the Head of BRGM,

> "BRGM focuses on restoring the peatland ecosystem to prevent flammability. The Ministry of Environment and Forestry (MoEF) plays a significant role in controlling forest and land fires in Indonesia, as they have policies and resources related to this issue. In the event of a forest and land fire disaster, the National Disaster Management Agency (BNPB) assumes a crucial position. Each stakeholder involved in forest and land fire control has their respective duties".

Similarly, Mr. Edy Afrizal (2022), the head of BPBD Riau, explained that.

> "MoEF holds regulations and authority in the forestry sector on a broader scale. BNPB takes charge of the command structure at the central level because they possess qualified personnel and equipment for handling disasters, including forest and land fires. These two institutions spearhead the efforts to control forest and land fires in Indonesia, while other stakeholders stand ready to receive orders and directions from them".

Other stakeholders with command structures down to the lowest level, personal power, and other vital tools and instruments to control forest and land fires are the TNI and POLRI. Since the beginning of President Joko Widodo's administration, the President has emphasized yearly that TNI and POLRI must be integral to controlling forest and land fires in Indonesia. TNI and POLRI are the key institutions, in addition to MOEF and BNPB, to coordinate fire prevention and suppression operations. They provide personnel, equipment, and logistical support to combat fires and ensure public safety. Even President Joko Widodo, on various occasions, has consistently revealed that if forest and land fires still occur in fire-prone provinces, the President will remove the position of TNI-POLRI leaders in the area (Afni et al., 2022b).

Mr. Made, the Executive Director of the NGO Riau Forest Rescue Working Network (Jikalahari), highlighted President Joko Widodo's practical approach to controlling forest and land fires. According to Mr. Made (2022),

> "President Joko Widodo has consistently instructed the Indonesian National Armed Forces (TNI) and the Indonesian National Police (POLRI) to engage in fire prevention and firefighting efforts actively. The TNI and POLRI have a hierarchical structure extending to the village level. The police have Bhabinkamtibmas, while the TNI has Babinsa. Additionally, the President has warned that if significant fires persist in a particular region, he will remove the TNI-POLRI leaders from their positions in that area. This message from the President is reiterated annually".

Similar sentiments were expressed by Mr. Edwin, the Coordinator of Manggala Agni Riau Province (MoEF), who emphasized the significance of the 2016

Presidential Instruction in enhancing collaborative efforts for fire management. According to Mr. Edwin (2022) ,

> "Following the 2016 Presidential Instruction, a multi-party task force was established, involving various entities such as the Indonesian National Armed Forces (TNI), Indonesian National Police (Polri), and local government representatives. The involvement of TNI and Polri in this intervention, mandated by the President, provided a stronger and more dedicated approach. Consequently, fire management became the main task, rather than an additional responsibility".

The TNI, through its territorial units, conducts patrols and surveillance in fire-prone areas to prevent and detect fires. They work closely with local communities and other stakeholders to raise awareness, educate, and enforce fire prevention measures (Prayoga & Koestoer, 2021). They also support community-based fire prevention initiatives and participate in community training programs (Maksum et al., 2019).POLRI is responsible for law enforcement related to forest and land fires. They investigate and prosecute individuals or companies involved in illegal burning or arson practices (Harrison et al., 2019). They collaborate with other agencies to collect evidence and build cases against perpetrators (Harrison et al., 2020)

The involvement of TNI and POLRI is critical in maintaining security, enforcing regulations, and supporting fire suppression efforts. Their collaboration with other stakeholders helps ensure effective fire management and prevention in Indonesia. However, challenges such as the complexity of inter-agency coordination and limited infrastructure still need to be overcome to improve fire management in the country (Prayoga & Koestoer, 2021).

Then there is the Peat and Mangrove Restoration Agency (BRGM), which is an institution that focuses on restoring damaged peatlands. Although it is not included in the regulation regarding one of the actors directly involved in controlling forest and land fires in Indonesia, BRGM has a vital role. It is known that many forest

and land fires also occur on peatlands that have damaged their ecosystems. Even forest and land fires on peatlands are more dangerous than on non-peat mineral land). Therefore, the presence of BRGM to restore damaged peatlands is a good thing that indirectly resolves forest and land fires in peatlands. It is also recognized that BRGM (formerly known as BRG) was an institution that was President Joko Widodo's quick response in 2016 when in 2015, there were severe fires that caused 2.6 million lands to burn and caused an extraordinary haze disaster.

According to Mr. Sarjono Budhi Subechi (2022), the long-standing Head of the BRGM Sub Working Group in Riau,

> "The primary focus of the BRGM is the restoration of degraded peatland ecosystems. The organization's key responsibility lies in rehabilitating these ecosystems, thereby preventing forest and land fires in peatland areas. To achieve this, the BRGM employs a comprehensive approach known as the "3 R's." This approach encompasses the rewetting of dry peatlands, the revegetation through replanting initiatives, and the revitalization of economic resources for local communities near peatlands. These efforts aim to ensure that both the ecosystems and the surrounding communities derive substantial benefits from well-maintained peatland ecosystems".

The Ministry of Agriculture in Indonesia also controls land and forest fires in Indonesia. Land clearing activities for agriculture, such as plantation expansion, have been identified as one of Indonesia's leading causes of forest fires (Adrianto et al., 2020; Goldstein, 2020). The Ministry of Agriculture grants concession licenses and regulates plantations, including oil palm and HTI plantations (Goldstein, 2020). However, there are disputes over the responsibility of plantation companies in causing or contributing to fires. The Ministry of Agriculture, along with other government agencies, has been involved in efforts to address and resolve annual forest fires in Indonesia (E. P. Purnomo et al., 2021)

Efforts to control forest and land fires require coordination between governments at both the national and local levels. The Ministry of Agriculture

collaborates with other government agencies, such as the Ministry of Environment and Forestry and the National Disaster Management Agency, to develop fire management strategies and policies (E. P. Purnomo et al., 2021). This collaboration aims to improve the effectiveness of fire prevention and suppression efforts. In addition to regulatory measures, the Ministry of Agriculture is also exploring alternative approaches to prevent land-clearing fires. For example, a policy experiment involving conditional cash payments was conducted in a fire-prone regency in West Kalimantan (Falcon et al., 2022). However, the experiment's results showed no significant effect on fire outcomes, suggesting that other factors, such as climate variations and population density, may substantially influence fire occurrence (Falcon et al., 2022).

BMKG is also an essential stakeholder in supporting efforts to control forest and land fires in Indonesia. BMKG, from the central to the regional level, continues to update meteorological and climatological data regularly sent and actively shared with various relevant stakeholders. One of BMKG's main contributions is providing accurate and timely meteorological data and forecasts. This information is critical for assessing weather conditions that contribute to the occurrence and spread of forest and land fires. By monitoring temperature, humidity, wind patterns, and other meteorological factors, BMKG helps identify periods of high fire danger and supports the planning and implementation of fire control strategies (Fitriany et al., 2021). BMKG also plays a role in detecting and monitoring fire activity through satellite-derived hotspot analysis. By correlating meteorological information with satellite data, BMKG can identify areas at risk of fire and provide early warning to relevant stakeholders (Fitriany et al., 2021). This early detection is crucial for rapid response and effective fire management.

In an interview conducted by Mr. Dwiyana (2022) from the Riau Province Environment and Forestry Service, it was highlighted that the Meteorology, Climatology, and Geophysics Agency (BMKG)

> "BMKG is very helpful to all stakeholders in controlling forest and land fires. BMKG updates various climate and weather information daily through the website and WhatsApp groups of stakeholders involved in controlling forest and land fires. We always refer to BMKG predictions to take the right steps in the future".

Furthermore, BMKG actively conducts research and development related to forest and land fires control. Through studies and assessments, BMKG evaluates the effectiveness of existing approaches and proposes innovative strategies for early fire detection and mitigation. For example, one study suggested using crowdsourced data from social media platforms like Twitter to improve fire early detection efforts (Fitriany et al., 2021).In addition to scientific and technical contributions, BMKG also plays a role in policy implementation and coordination. The agency works with other Indonesian agencies and stakeholders to develop and implement forest and land fires prevention and mitigation policies (Panjaitan et al., 2019). By providing expertise and guidance, BMKG contributes to formulating effective strategies and measures to address forest and land fires management challenges in Indonesia.

Besides the aforementioned parties, BRIN assists the government in developing weather modification techniques, commonly employed to create artificial rain in regions facing extended dry spells. BRIN (formerly BPPT) is essential in applying Weather Modification Technology (WMT) for forest and land fires control in Indonesia. WMT is a technological solution to control forest and land fires by increasing rainfall in potentially affected areas (Tukiyat et al., 2022). Applying WMT can increase precipitation by about 30% ((Widodo et al., 2020). By increasing rainfall, WMT helps reduce forest and land fires by reducing vegetation dryness and creating a more favorable environment for fire control efforts.

BRIN, specifically the Weather Modification Center, has conducted WMT in Indonesia since 2009 (Sandhyavitri et al., 2023). The center utilizes WMT to regulate atmospheric conditions and increase rainfall during the dry season when

forest and peatland fires are most likely to occur (Tukiyat et al., 2022). Increased rainfall helps reduce fire risk by keeping vegetation moist and preventing fire spread. In addition to increasing rainfall, WMT can also be used to reduce rainfall in certain areas (Widodo et al., 2020). This can be beneficial in flood prevention and water resources management in Indonesia. By reducing rainfall, WMT can help reduce flood risk and minimize the impact of hydrometeorological disasters.

The effectiveness of WMT in forest and land fires management in Indonesia, including in Riau Province, has been assessed through various studies. One study conducted in Riau Province in 2020 measured the effectiveness of WMTs in terms of rainfall intensity, reduction of hotspots, and increase in groundwater level (Tukiyat et al., 2022). The study found that the operation of WMTs increased rainfall and contributed to forest and land fires mitigation.

In an interview with Mr. Edwin (2022), the Coordinator of Manggala Agni Riau Province (MoEF), it was revealed that the Agency for the Assessment and Application of Technology (BPPT), now known as the National Research and Innovation Agency (BRIN), possesses advanced weather modification technology. This technology is utilized to mitigate the impact of prolonged droughts that can lead to forest and land fires. The BPPT, in collaboration with the Indonesian Air Force, the Ministry of Environment and Forestry (KLHK), and the Peat and Mangrove Restoration Agency (BRGM), applies this weather modification method. The interviewee expressed optimism about the positive effects of such technological interventions in effectively controlling and preventing land and forest fires.

In this case, NGOs also have an essential role in controlling forest and land fires. National NGOs play an indispensable role in preventing forest and land fires. NGOs such as WALHI National, Yayasan Konservasi Alam Nusantara (YKAN), Yayasan Kemitraan, etc., have positively contributed to forest and land fires control in Indonesia. One of the primary functions of NGOs is advocacy. They

advocate for firmer policies and regulations and encourage sustainable land management practices (E. P. Purnomo et al., 2021). Additionally, NGOs lobby to influence decision-makers and promote the adoption of effective fire prevention and management measures (E. P. Purnomo et al., 2021). NGOs shape the agenda and priorities for forest and land fires suppression in Indonesia through advocacy efforts.

According to Mr. Boy Jerry Sembiring (2022), the Executive Director of WALHI Riau,

> "The main function of an NGO is to advocate. We strive to make people aware of the dangers of forest and land fires. We socialize and advocate for them in remote villages. We also pressured the government to act more decisively against forest and land burners. This is the main key so forest and land fires do not recur".

In line with Mr. Boy, Mr. Made Ali (2022), the Executive Director of Jikalahari, similarly states

> "We support the government's collaboration to control forest and land fires. We are ready to support various efforts related to it. We also advocate for the wider community. We will continue to guard this issue so that it remains a serious concern of the government to be resolved immediately".

NGOs play an essential role in community engagement and capacity development as well. They provide local communities with the knowledge and skills to prevent and control forest and land fires (Nurjanah & Ishak, 2021). NGOs conduct training programs, seminars, and awareness campaigns to educate communities on fire prevention methods, early warning systems, and the significance of sustainable land management practices (Nurjanah & Ishak, 2021). By empowering local communities, NGOs contribute to developing resilience and enhancing communities' capacity to respond effectively to forest and land fires.

NGOs are also implementing strategies for fire prevention and management on the ground. They collaborate with local communities, government agencies, and other stakeholders to develop and implement initiatives for community-based fire management (Triyanti et al., 2023). Non-governmental organizations facilitate the participation of local communities in fire prevention activities. In addition, they aid in restoring degraded peatlands and implementing sustainable land management practices to lower the risk of forest and land fires. In addition to their direct participation in fire prevention and management activities, NGOs also contribute to generating knowledge. They conduct studies and evaluations to comprehend forest and land fires' causes and effects, evaluate fire control measures' efficacy, and identify best practices (E. P. Purnomo et al., 2021). Additionally, NGOs collaborate with academic institutions and other research organizations to generate evidence-based policy and practice recommendations(E. P. Purnomo et al., 2021).

Finally, forestry and plantation companies manage large land areas, including forests and plantations. They are interested in preventing and controlling fires, as fires can cause significant damage to their assets and operations. These companies often implement fire prevention measures such as creating firebreaks, conducting regular patrols, and implementing fire management plans (Thoha et al., 2019). They may also invest in fire detection systems and employ trained personnel to respond to fires immediately (Nurhidayah et al., 2023). However, it is essential to note that not all companies adhere to best practices in fire control. Some companies are associated with land-clearing practices contributing to fires, such as clearing agricultural land or expanding plantations (Gaveau et al., 2017; Thoha et al., 2019). In some cases, fires may occur due to inadequate land management practices, including land clearing for dry farming or conversion of secondary forests to plantations (Thoha et al., 2018).

Overlapping claims and land disputes can also complicate fire control efforts. Some concessions may have independent farmers within their boundaries, and companies may expand their activities beyond their designated concessions (Gaveau et al., 2017). This makes it difficult to attribute responsibility for fires and deforestation solely to forestry and plantation companies without detailed field investigations (Gaveau et al., 2017)

To address this challenge, forestry, and plantation companies must prioritize sustainable land management practices, including responsible land-clearing methods and fire prevention and control measures. Collaboration between companies, local communities, and government agencies is essential to ensure practical fire control efforts and promote sustainable land use practices (Triyanti et al., 2023). In addition, government regulations and law enforcement play an essential role in holding companies accountable for their actions and ensuring compliance with fire control measures.

According to Mr. Yuneldi (2022), the Head of the Fire Department of PT RAPP,

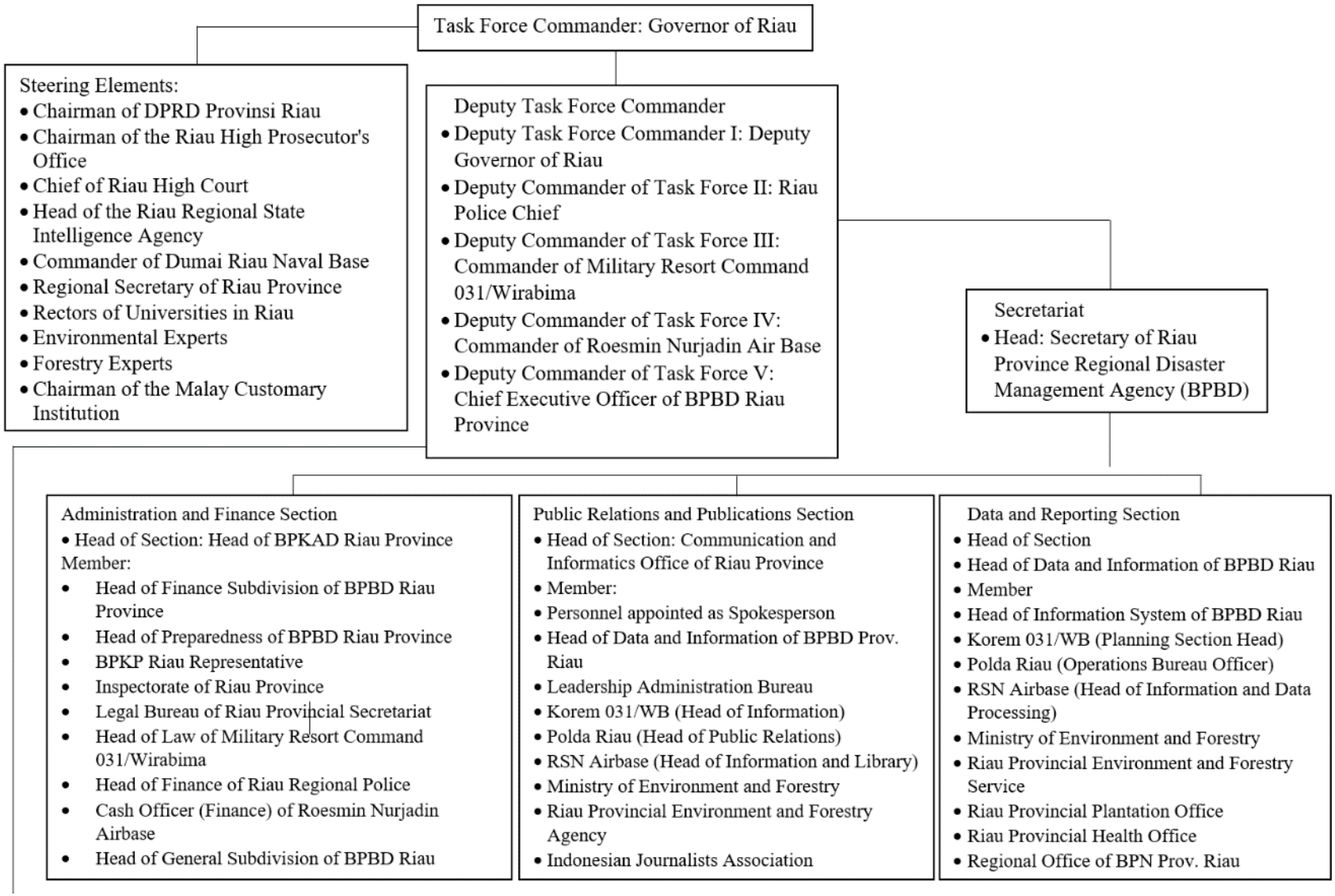
> "As a company engaged in the forestry sector, we are committed to eliminating forest fires in our concession areas. We have complied with the Minister of Environment and Forestry Regulation number 32 of 2016. We also help extinguish fires outside the concession area if there is an order from the government. We are ready to do it all as a form of our commitment to creating Zero Fire, at least in our concession area".

Mr. Yuneldi's statement highlights PT RAPP's dedication to preventing forest fires within their concession areas and compliance with relevant regulations. Furthermore, their willingness to assist in extinguishing fires beyond their concessions demonstrates their commitment to fire control efforts as a responsible forestry company.

In implementing multi-stakeholder collaboration for forest and land fire control at the provincial level, the Riau Province Forest and Land Fire Task Force is an all-encompassing platform that facilitates coordination and cooperation among various stakeholders. This initiative is consistent with the collaborative governance criteria proposed by Ansell and Gash (2008), which emphasize the need for a formal forum that facilitates stakeholder interaction and collective decision-making for the more significant benefit. Notably, the Forest and land fires Task Force comprises diverse stakeholders and government representatives. Therefore, the Forest and land fires Task Force illustrates effective collaborative governance in the context of forest and land fire control initiatives. The organizational structure of the Forest and land fires Task Force in Riau Province, as depicted in the figure, conforms to the guidelines outlined in Governor Regulation Number 9 of 2020 for Riau Province[4].

[4] For more details, see appendix 5

ORGANIZATIONAL STRUCTURE OF THE FOREST AND LAND FIRE CONTROL TASK FORCE OF RIAU PROVINCE



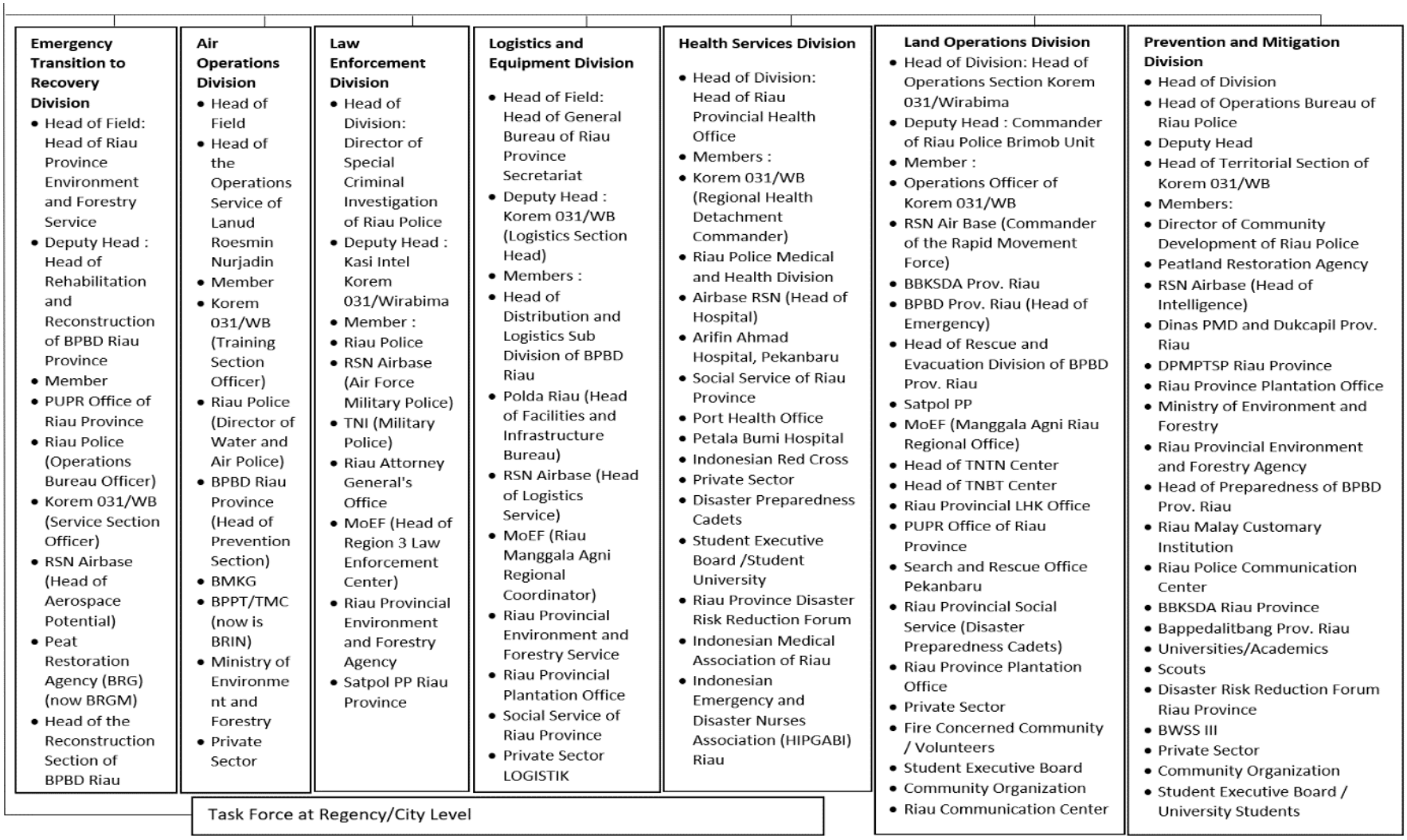


Figure 7. Organizational structure of the forest and land fire control task force of Riau Province

Notes:

BPDB	= Regional Disaster Management Agency
BPKAD	= Regional Assets and Finance Management Agency
BPKP	= Financial and Development Supervisory Agency
Korem 031/WB	= Military Resort Command 031 / Wirabima
Polda Riau	= Riau Regional Police
RSN Airbase	= Roesmin Noerjadin Airbase (Air base in Pekanbaru, Riau)
BPN Provinsi Riau	= National Land Agency of Riau Province
PUPR Office	= Public Works and Housing Office
Lanud	= Airbase
BRG	= Peatland Restoration Agency
BRGM	= Peatland and Mangrove Restoration Agency
BMKG	= Meteorology Climatology and Geophysics Agency
BPPT	= Agency for the Assessment and Application of Technology
TMC	= Weather Modification Technology
BRIN	= National Research and Innovation Agency
TNI	= Indonesian National Army
MoEF	= Ministry of Environment and Forestry
Satpol PP	= Civil Service Police Unit
BBKSDA	= Natural Resources Conservation Center
TNTN	= Tesso Nilo National Park
TNBT	= Bukit Tiga Puluh National Park
LHK Office	= Environment and Forestry Service
Dinas PMD dan Dukcapil	= Village Community Empowerment and Population and Civil Registry Office
DPMPTSP	= One-Stop Integrated Investment Office
Bappedalitbang	= Regional Development Planning, Research and Development Agency
Kasi Intel Korem 031/WB	= Intelligence Section Chief of Military Resort Command 031/Wirabima
BWSS III	= River Center of Sumatera Region III

Figure 8. Notes on Abbreviations in the Figure on the Organizational Structure of the Riau Province Land and Forest Fire Control Task Force

The organizational structure above (figure 7) shows that the governor of Riau Province is the Commander of the Riau Province Forest and Land Fires Task Force. The Governor of Riau is the person who will make the highest decision in various efforts made to control forest and land fires in Riau Province. In carrying out his duties as commander, the governor of Riau is assisted by five deputy commanders, namely the Deputy Commander of Task Force I held by the deputy governor. The Deputy Task Force Commander I assists the Governor of Riau, who also serves as the Task Force Commander, in coordinating and planning forest and

land fire control activities from the village to the provincial level. Strong leadership ensures that all resources in the area are mobilized effectively.

In addition, the Deputy Commander of Task Force II is the Chief of Riau Police. In this role, the Chief of Police is a strategic partner to the Governor of Riau in coordinating, planning, and commanding law enforcement-related potential. Through close cooperation with the police, measures against law violations related to forest and land fires can be carried out effectively. The Deputy Commander of Task Force III is the Commander of Military Resort 031/ Wirabima, playing an essential role in land operations. The Military Resort Commander assists the Governor of Riau as Commander of the Task Force in coordinating, planning, and commanding potential related to ground operations. With strong military support, operational steps can be taken with the precision and agility required in emergencies.

Furthermore, the Deputy Commander of Task Force IV is the Commander of Roesmin Noerjadin Air Base, responsible for coordinating, planning, and commanding the potential associated with air operations. Through close cooperation with relevant parties, including the Air Force and other relevant institutions, they ensure that forest and land fire control measures in Riau Province also involve a practical air operational approach.

Finally, the Deputy Commander of Task Force V is the Acting Head of Riau Province's Regional Disaster Management Agency (BPBD). His main task is to assist the Governor of Riau as Task Force Commander in coordinating, planning, and commanding the available potential for activities in the secretariat, activation of the central command post, as well as coordinating forest and land fire control activities with the National Disaster Management Agency (BNPB). With effective leadership, they ensure the coordinated and efficient execution of tasks.

Riau Province's Forest and Land Fires Task Force has demonstrated commendable adherence to the principles of cooperative governance involving multi-actor collaboration at the regional level. In the next section, it is imperative to examine matters relating to their collaborative efforts thoroughly. This analysis aims to provide insights into the complexity of their cooperative efforts and emphasize the success of their collaborative governance strategy.

4.6 Decoding Collaboration: Key Processes, Decision-Making, and Outcomes in Forest and Land Fire Management

It is important to conduct an in-depth analysis of how the collaboration process works, the decision-making mechanisms, and the impacts of collaboration in Riau Province. My research analyzes the collaboration process in controlling forest and land fires in this province. The collaborative process is a crucial aspect of collaborative governance for handling forest and land fires in Riau Province, Indonesia. The available references provide insights into the collaborative process and its impact on the effectiveness of collaborative governance. Ansell & Gash (2008) emphasize the importance of face-to-face dialogue, trust-building, and the development of commitment and shared understanding in the collaborative process. They argue that a virtuous cycle of collaboration tends to develop when collaborative forums focus on "small wins" that deepen trust, commitment, and shared understanding.

First, it should be highlighted that the structure of multi-stakeholder collaboration in controlling forest and land fires in Riau Province has succeeded in accommodating all stakeholders. Representatives from various institutions, including the central government, provincial government, down the village level, NGOs, academics, and community groups, have gathered in a structure known as the Forest and Land Fire Mitigation Task Force (Forest and Land Fires Task Force). Involving these various parties ensures that collaboration includes a variety of perspectives and interests by the principles of collaborative governance theory

(face-to-face dialogue). It is important to appreciate the suitability of this collaboration with the characteristics of collaborative governance theory. In addition, it should be noted that there are rules in this collaboration that reflect the important role of multi-stakeholders in controlling forest and land fires. This shows commitment to achieving the common goal of overcoming the problem of forest and land fires in Riau Province. It is important to appreciate how this collaboration conforms to the characteristics of collaborative governance theory. In addition, it should be noted that there are rules in this collaboration that reflect the important role of multi-stakeholders in forest and land fire control. This shows a commitment to achieving a common goal in addressing the problem of forest and land fires in Riau Province. This includes efforts to commit and build trust and shared understanding.

Mr. Edwin Putra (2022), as the Coordinator of Manggala Agni for Riau Province, which is a vertical institution from the Ministry of Environment and Forestry, said:

> "Structurally, we can say that everything is much better prepared, for example, if we compare it first with before the severe forest and land fires in 2015. Now, we have a task force with its duties and roles. Like us, Mangala Agni focuses on the ground operations division. Then, with the involvement of the TNI-POLRI, of course, this makes our team stronger and ready to face the dry season that comes every year."

In line with Edwin, Mr. Yuneldi (2022), the head of the Department of Forest and Land fires fighter at PT. RAPP says that:

> “The existence of a forest and land fires task force makes coordination easier. Like us, we RAPP are ready to eliminate fires in our concession area. But that's not all; we are prepared to assist the government and the Forest and land fires task force to operate according to their directions. We stand ready to deploy the necessary assistance to extinguish the fire.”

Mr. Made Ali (2022), the Executive Director of the NGO Jikalahari, said:

> "We feel that the government is more prepared. Every stakeholder has their duties. This is a positive thing, especially with the involvement of the TNI-POLRI in controlling forest and land fires. It is hoped that this synergy between stakeholders can reduce the number of forest and land fires in Riau and Indonesia."

The collaboration process begins with an annual meeting to prepare for the upcoming dry season in the middle of the year. This meeting starts at the national level and is chaired by the President or Minister who is sent, followed by a preparatory meeting at the provincial level. These meetings aim to formulate an effective strategy and action plan in dealing with potential forest and land fires in Riau Province.

Mr. Dwiyana (2022), a functional official from the Riau Province Environment and Forestry Service, explained:

> "Regarding the directives in preparing for the dry season, which impacts forest and land fires, all are from the directions at the central level first (Top-Down). After directives from the central government regarding preparations for forest and national fires, we at the provincial level and below did the same thing. This preparation is important to provide the same understanding and perception of all stakeholders involved in controlling forest and land fires in Indonesia."

Mr. Budi Hidayat (2022) as Head of the Kampar Kiri Forest Management Unit said

> " As forestry stakeholders at the site level, we await directions from above. If there are directives, we will prepare to face the dry season, operational and non-operational preparations. We also continuously campaign for the opening of agricultural land by burning."

The first meeting at the national level is an important moment where all stakeholders gather to discuss, exchange information, and agree on anticipatory steps. Representatives from the central government, provincial government, down to the village level, non-governmental organizations (NGOs), academics, and community groups are all incorporated into a structure called the Task Force for

Forest and Land Fire Management (Forest and Land Fires Task Force). Each stakeholder has roles and responsibilities in preventing and controlling fires. In this meeting, the BMKG delivered long-term weather forecasts for the year, including the potential for the El Nino phenomenon to increase the risk of fires. This information is essential because it will become a reference for the Forest and Land Fires Task Force to take strategic steps in dealing with weather conditions that affect the risk of fires in Riau Province. In addition to the annual meeting, the collaboration continues in online and real-time monitoring of forest and land fires. The two main applications used are the Sipongi application, owned by the Ministry of Environment and Forestry, and the Lancang Kuning application, developed by the Riau Regional Police. All stakeholders can monitor potential hotspots throughout the Riau Province through these applications. If a hotspot is detected, the nearest team will immediately confirm whether it is a forest and land fire or just a fake hotspot.

At the village level, the collaboration involves Village Trustee Noncommissioned officer (Babinsa-Indonesian Army) and Community Police Officer (Babinkamtibmas-Indonesian Police) officers who work closely with village officials and communities concerned about fires. They play a role in early detection and response if a fire occurs in their environment. They would put it out instantly if the fire could be dealt with immediately. However, if further assistance is needed, stakeholders at the village level will report to the Forest and Land Fires Task Force for other action. Not only focusing on the moments before and after the fire incident, but this collaboration also involved socialization and campaigning efforts ahead of time. Stakeholders play an active role in socializing the dangers of clearing agricultural land by burning it to the wider community. This is done to increase public awareness of the dangers of forest and land fires, the importance of prevention in protecting the environment, and the sustainability of natural resources.

After knowing the collaborative process, it is important to analyze the decision-making mechanism. Suppose collaboration always begins with directions from the central to the lower level (Top-Down). In that case, strategic decision-making related to collaboration in controlling forest and land fires tends to be bottom-up, namely from the bottom. The first thing that should be observed is that according to Governor Regulation 9 of 2020, three forest and land fire control emergencies exist. These are emergency alert, emergency response, and recovery emergency transition status. The emergency alert status is a condition in which the level of preparedness and vigilance in dealing with the potential for forest and land fires increases significantly. This status is usually imposed before the onset of the dry season when the risk of fire rises due to dry weather conditions and wind, which can trigger the rapid spread of fires. Emergency response applies when massive forest and land fires occur or threaten large areas. The fire situation has reached an emergency level, which requires a quick response and intensive coordination from all stakeholders involved. Emergency response requires mobilizing all available forces and resources to extinguish and control fires so they do not spread and cause serious impacts on the environment, society, and the economy. After the forest and land fires were controlled, the recovery emergency transition status was imposed. At this stage, efforts to restore and rehabilitate the environment affected by the fires are the main focus. In addition, related parties must also carry out a thorough evaluation of the response and handling of fires that have been carried out to identify strengths and weaknesses and map out future corrective steps[5].

In controlling forest and land fires in Riau Province, the three emergency statuses (emergency alert, emergency response, and emergency to recovery) are taken in stages, from the lowest to the highest level. The decision-making process

[5] To see in more detail regarding determining emergency status, see appendix 6

is carried out through meetings involving all stakeholders to share information and equalize perceptions to initiate collaborative steps.

Initially, before the dry season arrived, all stakeholders were involved in a preparatory meeting to evaluate the current situation and conditions. When the dry season is approaching, a meeting is held to determine whether it is time to upgrade the status from normal to the emergency alert. This status was upgraded at the regency/city level and in Riau Province. The upgrade from emergency alert to emergency response status was also carried out based on predetermined considerations and criteria. Meetings involving stakeholders at the provincial level were held to determine whether establishing an emergency response status needs to be done at the provincial level. Each increase in emergency status is followed by steps and action plans that are adjusted to the level of the emergency. When conditions are under control and fires are minimized, returning from crisis to recovery. Coordination meetings are held to formulate steps in the recovery and rehabilitation stages of the environment and affected communities.

This tiered decision-making mechanism provides flexibility and responsiveness in handling emergencies and ensures that all stakeholders can actively participate in the collaborative process. Through continuous meetings and good communication, decisions regarding the emergency status are taken based on a thorough evaluation and analysis of the current situation. To increase the effectiveness of collaboration, the decision-making process can be further enhanced through advanced information and communication technologies, such as real-time weather and fire monitoring systems. In addition, periodic updates on emergency status can be communicated transparently to the public so that community participation and awareness in fire control can also be increased.

Based on the previously described process, confirmation was acquired from multiple sources. Informants reported that decision-making adhered to a hierarchical structure, commencing at the grassroots level. This is important

because those who understand the real condition of forest and land fires are the people at the grassroots level.

One anonymous informant (2022) stated:

> "Decisions regarding forest and land fires come from the grassroots level. Meetings are held to hear input and opinions from all relevant stakeholders before making a decision."

Mr Edwin Putra (2022), as the Coordinator of Manggala Agni in Riau Province, also shares the same view:

> “Decisions are taken hierarchically. First, at the district or city level, our team at operational locations is usually invited to provide input. After that, the district or city government makes the decision. The same process applies at the provincial level."

The hierarchical decision-making process ensures that input from all levels and stakeholders is considered, and decisions are based on a comprehensive understanding of the situation. This approach is critical in effectively managing forest and land fires and promotes collaboration among various stakeholders. By involving those on the ground and combining their knowledge and expertise, the decision-making process becomes more informed and relevant to addressing the challenges of forest and land fires in Riau Province.

Regarding outcomes, compared to pre-2015, when fire management lacked focus and organization, the current success in regulating forest and land fires represents a substantial improvement. The 2015 conflagration served as a wake-up call, compelling the Indonesian government to recognize the gravity of the problem and confront it with greater urgency. This positive shift is supported by compelling evidence, such as the establishment of a specialized forest and land fire task force, the active participation of various stakeholders from government and non-government sectors, the implementation of clear regulations, and the

implementation of a sophisticated monitoring system employing cutting-edge technologies such as the Sipongi system and the Lancang Kuning Dashboard.

However, the issue arises as to why there was a significant increase in forest fires in 2019 following the 2015 incident that destroyed 2.6 million hectares of land. El Nino and other extreme weather conditions exacerbated fire risks. In addition, the government's potential complacency, which may have resulted from relatively effective fire suppression in the years following 2015, may have unwittingly contributed to the resurgence of forest fires in 2019. Indonesia can improve forest and land fire management further by learning from past difficulties and implementing a more proactive approach. The government should intensify measures to mitigate the effects of El Nino and extreme weather events and increase awareness campaigns to discourage illegal land clearance by burning.

One informant (2022) who did not want to be named said:

> "2019 El Nino had a big impact; even though El Nino is a supporting factor, it allows arsonists to open plantation land by burning forests and land. There is also information that the government seemed complacent with small wins in 2016, 2017, and 2018, where the government was quite good at controlling forest and land fires in Indonesia."

Mr. Edwin Putra (2022), the Coordinator of Manggala Agni for Riau Province, also said:

> "El Nino is one of the supporting factors contributing greatly to forest land and fires in Indonesia in 2019".

In summary, the collaborative process is an important aspect of collaborative governance to address forest and land fires in Riau Province. It involves face-to-face dialogue, trust building, and the development of shared commitments and understandings among stakeholders. This collaborative process also includes the implementation of inter-organizational networks and the engagement of pressure groups and civil society organizations. Overcoming bureaucratic barriers and

fostering intergovernmental collaboration are important challenges to overcome to improve the effectiveness of the collaborative process in forest and land fire management in Riau Province**.**

4.7 Building the Framework: How Initial Conditions, Institutional Design, and Facilitative Leadership Collaborative Governance in Indonesia's Forest and Fire Management

Improving collaborative governance in forest and land fire management in Indonesia, both generally and in Riau, requires careful consideration of four key components: initial conditions, institutional design, facilitative leadership, and collaborative processes, as proposed by Ansell & Gash (2008). These components work together to create a robust framework for collaboration. In addition, it is essential to realize that three other important factors influence collaborative processes. By improving each of these components and understanding the interconnectedness of the collaborative process, the overall approach to collaborative governance can be significantly strengthened. This comprehensive approach will better equip stakeholders to address the complex challenges of forest and land fire management, leading to more effective and sustainable solutions for the environment and society (see Figure 5).

Collaborative governance starts with assessing the initial conditions. This involves examining the context in which collaboration occurs, including the history of conflict or cooperation among stakeholders, incentives for stakeholders to participate, power and resource imbalances, and existing leadership and institutional structures (Ansell & Gash, 2008). The second component of the model is institutional design. This refers to the formal and informal rules, structures, and processes that govern collaborative governance arrangements. Evaluating institutional design includes assessing the clarity of roles and responsibilities, inclusiveness of decision-making processes, conflict resolution mechanisms, and supportive legal and policy frameworks (Ansell & Gash, 2008).

Facilitative leadership is another essential component of collaborative governance. It involves the leader's role in encouraging collaboration, building trust among stakeholders, facilitating communication and coordination, and ensuring the effective functioning of collaborative processes. Evaluating facilitative leadership includes assessing the leadership qualities and skills of the individuals involved, their ability to create an environment conducive to collaboration, and their commitment to the goals of the collaborative effort (Ansell & Gash, 2008). The collaborative process itself is the fourth component of the model. It refers to interaction, communication, and decision-making among stakeholders. The collaborative process involves assessing the level of face-to-face dialogue, trust-building activities, the development of commitment and shared understanding, and the ability to achieve tangible results (Ansell & Gash, 2008). This has been discussed in section 5.6.

In summary, evaluating collaborative governance according to this model involves assessing initial conditions, institutional design, facilitative leadership, and collaborative processes. This section will describe and analyze the focus on the three components that influence the Collaborative Process: Initial Conditions, Institutional Design, and Facilitative Leadership.

4.7.1 Initial Conditions

According to Ansell & Gash (2008), initial conditions involve examining the history of conflict or cooperation between stakeholders, incentives for stakeholders to participate, power and resource imbalances, leadership, and institutional design. Based on the research conducted on forest and land fire management in Riau Province, several conclusions can be drawn regarding the history of conflict and cooperation between stakeholders. Various stakeholders have experienced friction and cooperation. Non-governmental organizations (NGOs) have played a role as pressure or watchdog groups, closely monitoring government performance. In this context, NGOs such as WALHI and Jikalahari

have consistently criticized the government when some policies or actions contradict their views. On the other hand, NGOs and the government have also collaborated in advocacy efforts, community empowerment, and campaign or socialization programs related to environmental issues.

These findings show no significant problems among the stakeholders involved in controlling forest and land fires in Riau Province. Although there are sometimes differences of opinion, this is normal in a collaborative process. In addition, there are mutually beneficial relationships between some stakeholders, including private stakeholders such as the RAPP Fire Department, which has a history of establishing symbiotic mutual partnerships with other parties, especially the Riau Provincial Government. Understanding the historical context of conflict and stakeholder collaboration is crucial in developing a more comprehensive and structured approach to addressing forest and land fires.

In terms of incentives, it is clear that all parties working within the Land and Forest Fire Control Task Force receive financial support from the Riau Provincial APBD for various activities related to fire prevention and suppression in the field.[6] In addition, the Task Force also receives funding from the central government's state budget as additional funding for land and forest fire control. However, NGOs and the Private Sector use funds from their institutions as they already have their funding sources. NGOs have previously received funds from various funding sources, especially international ones. Meanwhile, companies must budget for forest and land fire control activities,

[6] APBD is short for Regional Revenue and Expenditure Budget. It is a financial planning document prepared by local governments in Indonesia, such as provinces, districts, and cities. The APBD outlines the revenue sources and expenditure allocations of the local government for one fiscal year. It includes revenues from various sources, including taxes, balancing funds from the central government, as well as own-source revenues.

both in their concession areas and other areas assigned by the government. In addition, RAPP also has a flagship program to prevent forest and land fires in various villages in Riau Province, known as "Fire Free Village." Villages that successfully prevent forest fires in their area will receive hundreds of millions of rupiah in incentives that can be used for the welfare of the village community.

Related to the imbalance of power and resources in collaboration, this is natural because each actor has a different ability to collaborate. As one of the stakeholders, the government has substantial expertise and resources in controlling forest and land fires, especially in terms of extinguishing in the field because it is equipped with adequate knowledge and equipment. Manggala Agni, TNI, and POLRI, in particular, have specialized competencies in firefighting that enable them to act quickly and appropriately. On the other hand, NGOs focus more on socialization and advocacy for communities. At the same time, private parties such as RAPP can also monitor forest and land fires in their areas. This is natural because private companies will lose money if fires occur in their concession areas, so they have the motivation to be actively involved in fire control efforts.

In terms of leadership, the design of this collaboration was wise enough to appoint the Governor of Riau as the Regional Head and Commander of the Riau Province Land and Forest Fire Control Task Force. The placement of the Governor as the leader is very appropriate as it allows for effective coordination of all resources and ensures prudent decision-making. Previously, all stakeholders were involved in the decision-making process so that decisions reflected diverse perspectives and were collaborative.

The institutional design of the Land and Forest Fire Control Task Force has proven effective in representing all stakeholders involved. The involvement of all parties ensures that each party's role is considered and optimally utilized to

achieve common goals in controlling forest and land fires in Riau Province. It is important to remember that an imbalance of power and resources can be a strength if managed wisely. Good collaboration respects the roles and contributions of each party, utilizing their expertise and resources to achieve common goals and realize sustainability in controlling forest and land fires in Riau Province.

In summary, the initial conditions for collaborative governance of forest and land fire management in Riau Province, Indonesia, involve a history of conflict or cooperation, power and resource imbalances, leadership, and institutional design. The involvement of stakeholders, pressure groups, and challenges associated with land and forest fire management are also essential aspects to consider in evaluating the baseline. These factors can provide insights into collaborative governance's effectiveness and potential challenges in addressing forest and land fires in Riau Province.

4.7.2 Institutional Design

Ansell & Gash (2008) emphasize the importance of institutional design in collaborative governance. This involves examining the formal and informal rules, structures, and processes that govern collaborative governance arrangements. Evaluation of institutional design includes assessing the clarity of roles and responsibilities, inclusiveness of decision-making processes, conflict resolution mechanisms, and supportive legal and policy frameworks.

In the context of forest and land fire management in Riau Province, an essential first step is to explore and analyze the agreed rules of the game. In this case, two principal regulations serve as references in the collaboration to control forest and land fires in Riau Province, namely Riau Province Regional Regulation No. 1 of 2019 concerning Technical Guidelines for Forest and Land Fire Control and Riau Governor Regulation No. 9 of 2020 concerning

Procedures for Determining Disaster Emergency Status and Head of the Forest and Land Fire Control Task Force in Riau Province. These two regulations are the primary basis for collaboration.

In terms of structure, Riau Governor Regulation No. 9/2020 on Procedures for Determining the Status of Disaster Emergencies and the Head of the Forest and Land Fire Control Task Force in Riau Province established a new formal forum that serves as a forum for collaboration, namely the Forest and Land Fire Control Task Force in Riau Province. Within this structure, various stakeholders from different backgrounds have been involved, and the roles of each stakeholder are outlined according to their capacity and capability. For example, the TNI is involved in forest and land fire control, with the Army focusing on ground operations and the Air Force focusing on air operations. This is a concrete example of the division of tasks within the Riau Province Land and Forest Fire Control Task Force.

In section 4.6, it was explained how the decision/policy-making process is taken, namely from the bottom up. This is important in the collaboration process so that decisions are not authoritarian but involve information sharing from all stakeholders. In summary, the institutional design of collaborative governance in handling forest and land fires in Riau Province involves formal rules, structures, and processes that govern collaborative governance. The existence of a supportive legal and policy framework, as well as the involvement of pressure groups and civil society organizations, are essential aspects of institutional design.

4.7.3 Facilitative Leadership

Ansell & Gash (2008) emphasized the importance of face-to-face dialogue, trust building, and developing commitment and shared understanding in collaborative processes. They argue that a virtuous cycle of collaboration tends

to develop when collaborative forums focus on "small victories" that deepen trust, commitment, and shared understanding. In the context of forest and land fire management in Riau Province, the forest and land fire task force has a command structure. The Governor of Riau acts as the task force's commander, which has a top-down authoritative function. However, the decision-making process starts with a bottom-up approach, where all stakeholders share information and their views.

Facilitative leadership by the Governor of Riau effectively mobilized resources within the task force. The command structure helps in quick and appropriate decision-making, especially when dealing with emergencies such as forest and land fires. When decisions are made, the top-down approach helps the efficient implementation of actions and good coordination. The emphasis on "small wins" that this collaborative forum strives for has a positive impact. Each small step towards tackling forest and land fires becomes an achievement that deepens mutual trust among the stakeholders involved. These successes increase their trust in the collaboration and foster their enthusiasm and commitment to continue working together to solve the problem.

Thus, the facilitative leadership assumed by the Governor of Riau in the Riau Province's forest and land fire task force was critical to the success of collaborative governance. Combining a bottom-up approach to decision-making and a top-down command structure for action implementation proved effective in achieving "small wins" that strengthened cooperation and shared understanding.

Overall, this comprehensive evaluation of collaborative governance in forest and land fire management in Indonesia, focusing on Riau, involved an in-depth analysis of initial conditions, institutional design, and facilitative leadership. Addressing the complexities of forest and land fire management requires a holistic approach considering these components' interaction. By continuously

improving each component, collaborative governance can be enhanced to effectively address challenges and drive sustainable solutions to benefit the environment and society. This integrated approach will further empower stakeholders to work together, ensure a coordinated response to the issues, and ultimately lead to successfully controlling forest and land fires in Riau.

4.8 Conclusion

This chapter thoroughly reviews the implementation of collaborative governance in the management of forest and land fires in Riau Province. The regulatory framework is essential since it establishes explicit principles that offer a robust legal foundation for addressing and mitigating these incidents. The rule emphasizes the significance of non-governmental organizations, guaranteeing a consistent and participatory methodology that actively involves many stakeholders. This inclusive approach promotes a comprehensive strategy for forest and land fire control by including diverse perspectives and resources, which is crucial for properly addressing the complexity of this intricate issue.

The Forest and Land Fire Control Task Force employs a bottom-up decision-making method that fosters extensive stakeholder participation and engagement. Nonetheless, a top-down authoritative framework guarantees efficient and effective strategy execution. This hybrid method, which integrates participatory decision-making with robust leadership in execution, underscores the adaptability and essence of effectively organized collaborative governance in tackling intricate difficulties.

This chapter seeks to deliver a definitive classification and comprehensive analysis of multi-stakeholder collaboration in managing forest and land fires. This chapter provides essential insights into the functioning of collaborative frameworks and can inform strategies to enhance future initiatives to mitigate forest and land fires in the region.

5. Challenges and Opportunities for Implementing Collaborative Governance in Forest and Land Fire Control in Indonesia

5.1 Introduction

Chapter five of this research study explicitly discusses Research Question 2 (RQ2): "What are the challenges and opportunities for implementing collaborative governance in controlling forest and land fires in Indonesia?" This chapter begins by analyzing the strengths gained from multi-stakeholder collaboration in controlling forest and land fires that have been implemented. Next, the following section highlights weaknesses in collaboration and identifies three main challenges: lack of knowledge among stakeholders, financial constraints, and lack of transparency and accountability.

The next segment analyzes weak law enforcement in Indonesia, especially regarding forest and land fires. This includes exploring issues related to rent-seeking and corruption. Interestingly, this analysis shows the interconnection between companies in neighboring Malaysia and Singapore, which have an essential role in forest and land fires in Indonesia. Looking ahead, there will be an analysis of external barriers to collaboration, which include economic, social and political barriers. After that, an essential segment attempts to answer whether the collaboration has failed. The concluding section provides an exit strategy that offers four recommendations for resolving Indonesia's complex problem of forest and land fires.

5.2 The strength of collaboration in controlling forest and land fires.

One of the main strengths of Riau's forest and land fire management is the improved collaboration between all stakeholders involved, including the central government, local governments, NGOs, communities, and the private sector. This collaboration was poor before the severe forest and land fires in 2015. However, after the incident, the government responded well and focused on restoring

damaged peatlands and other positive efforts (Irawan et al., 2022). This has made forest and land fire control more organized and structured and has a clear regulatory basis. In addition, the involvement of the Indonesian National Defense Forces (TNI) and the Indonesian National Police (POLRI) in controlling forest and ground fires has also had a significant positive impact. TNI-POLRI has a territorial structure that extends to the lowest level, so they can be at the forefront of preventing and monitoring forest and land fires at the village level. Village Trustee Non-Commissioned Officer (Babinsa-Indonesian Army) and Village Police Officer (Bhabinkamtibmas-Indonesian Police) are the leading forces in preventing and monitoring forest and land fires (Anhar et al., 2022).

Budi Hidayat (2022), Head of Kampar Kiri Forest Management Unit said:

> "One of the efforts that is very helpful in controlling forest and land fires is the involvement of TNI and Polri structures as well as lower structures such as Babinsa and Bhabinkamtibmas. This is a concrete form that this control must be carried out in cooperation, not just relying on one or two stakeholders."

Using integrated monitoring systems is also advantageous in controlling forest and land fires in Riau. For example, the MoEF developed the Real Time Forest and Land Fire Detection System (Sipongi). This system can detect forest and land fires directly and provide real-time information. In addition, Riau Police also has the Lancang Kuning Dashboard System, which has the same function (Irawan et al., 2022). This integrated and unified monitoring system makes controlling forest and land fires easier and more effective. Apart from that, decision-making that is bottom-up but implementation is also valuable for controlling forest and land fires in Riau. This means that initial decisions are taken through collaboration and participation of various parties involved. However, after a decision is taken, its implementation is carried out under the command of the competent authority. This approach makes the collaborative management of forest and land fires in Riau more effective and efficient (Maksum et al., 2019).

Made (2022), executive director of Jikalahari, said:

> “Sipongi is here to be a system that is very helpful in controlling forest and land fires. The system is already perfect, but there needs to be an increase in the efforts of all stakeholders in monitoring and responding to all hotspots that appear in Sipongi to be checked immediately. If there really is a fire, the nearest unit must immediately go to the location to extinguish it quickly.”

It does appear that the implementation of multi-stakeholder collaboration in overcoming forest and land fires in Indonesia since 2015 has produced significant progress. This approach reflects shared responsibility, which can be seen from the formulation of regulations and the formation of forest and land fire mitigation task forces from the national level to the village level. Therefore, it is not only the Ministry of Environment and Forestry (KLHK) and the National Disaster Management Agency (BNPB) that bear the burden of overcoming this complex problem, but rather an inclusive effort that involves stakeholders at all levels.

As stated by Jhony Mundung (2022), Expert Staff to the Governor of Riau for Environment and Forestry:

> "Decision-making is carried out from the bottom up by listening to all parties involved. Top-down command structure to ensure that everything goes according to plan."

The bottom-up decision-making approach in the forest and land fire control task force reflects democratic principles. This allows for the incorporation of diverse viewpoints and considerations from all stakeholders involved. What is most commendable is that once a decision is reached, the structure changes to become command-oriented. This ensures that all parties involved work cohesively, by the roles and functions that have been determined in controlling forest and land fires effectively. This approach not only encourages inclusivity and democratic participation but also simplifies strategy implementation, increasing the overall effectiveness of forest and land fire control efforts. This is a significant step forward in overcoming the problem of forest and land fires in Indonesia.

5.3 The weaknesses of collaboration: What is missing?

In implementing collaboration involving multi-stakeholders, of course, it is not always perfect. In many cases, collaboration can fail or at least not go well. In the literature review conducted, ten factors that can lead to failure in multistakeholder collaboration were identified (see Figure 3, page 39). These factors are Lack of Leadership, Limited Knowledge of Actors, Financial Problems, Poor Communication between Actors, Power Imbalance, Lack of Trust among Actors, Misunderstanding, Weak Political Will, Lack of Accountability and Transparency, and Political and Interest Conflicts. To further elucidate this, a table was created to provide a detailed explanation of each factor.

Table 10. Explanation of the factors that cause collaboration failure

No	Weaknesses/Factors causing failure	Findings	Description
1.	Lack of Leadership	Issue not found	With the existence of the Forest and Land Fire Control Task Force, leadership patterns in collaboration can be clear and well-coordinated
2.	Limited Knowledge of Actors	Lacking/weak	Not all actors controlling forest and land fires have the same capabilities. For example, in the case of extinguishing forest and land fires in the field, fire personnel from
3.	Financial Problems	Lacking/weak	Even though the task force for extinguishing forest and land fires has its budget, it needs a mechanism for providing fair and fair rewards for firefighters who do their job well to motivate them to work as well as possible.
4.	Poor Communication between actors	Lacking/weak	Communication between actors runs quite well in a task force where decision-making is always bottom-up.
5.	Power Imbalance	Lacking/weak	So far, no power imbalance has

			been found in collaboration
6.	Lack of Trust among Actors	Lacking/weak	Serious issues related to lack of trust among actors were not found. It is only limited to a check and balance mechanism between the actors involved, for example, NGOs providing data to government actors or the community providing input regarding fire prevention and extinguishing, etc.
7.	Misunderstanding	Lacking/weak	So far, no significant misunderstandings have been related to controlling forest and land fires.
8.	Weak Political Will	Lacking/weak	So far, there have been no indications of weak political will from the political leadership to control forest and land fires. The president has repeatedly instructed all his staff to be serious about controlling forest and land fires by their respective responsibilities.
9.	Lack of Accountability and Transparency	Lacking/weak	It was found that there is still a lack of transparency in law enforcement in forest and land fire cases. This issue is important because law enforcement is a very important part of this case.
10.	Political and Interest Conflicts.	Issue not found	So far, there have been no issues related to political and interest conflicts in controlling forest and land fires.

The table 10 explains the findings regarding weaknesses or factors that cause failure in multistakeholder collaboration in controlling forest and land fires in Riau Province. There were 3 weaknesses found, namely limited knowledge of actors, financial problems and Lack of Accountability and Transparency. Below is an explanation regarding this matter.

6.3.1 Lack of knowledge of actors.

Lack of knowledge regarding the actors in controlling forest and land fires has become a serious obstacle to effective collaborative efforts. Controlling forest and land fires involves various parties, including firefighters, disaster management task forces, local communities, and the government and private sectors. Problems related to this lack of understanding are mainly related to the different capabilities and knowledge between the various forces involved in fighting forest and land fires.

Edwin Putra (2022). Coordinator of Manggala Agni, Riau Province, who is one of the spearheads of the Ministry of Environment and Forestry in preventing and extinguishing fires, said:

> "We are firefighters who have been given special training to extinguish forest and land fires on mineral and peat lands. We can read the direction of the wind, know how fire can be controlled and other knowledge that we gain through training and experience. This knowledge is needed for various parties who want to join in extinguishing fires in the field. "So far, we have often trained people to care about fire in various villages and trained them to be ready to help when there are forest and land fires in their area."

Yuneldi (2022), Head of PT Fire Department. RAPP (APRIL GROUP) says:

> “We have everything needed, both in terms of personnel and equipment. We are given special training. So we know what to do when there is a fire. For stakeholders who need these skills, we are ready to assist."

One important finding in this context is that extinguishing forest and land fires requires techniques much different from extinguishing urban fires, which often occur in buildings and infrastructure. In urban firefighting, the primary focus is isolating and extinguishing hotspots in buildings and vehicles. However, when it comes to forest and land fires, we are faced with a much bigger challenge.

A limited understanding of the differences in fire suppression on various types of land exacerbates this lack of knowledge. Fires on mineral or hard land have different characteristics from fires on peat land. Fires on peatlands, for example,

require much more intensive efforts because they can occur below the ground surface. One serious problem often encountered is that the fire may appear to have been extinguished but is still burning in the subsurface layers of the soil.

Not only that, fires on peatlands also produce smoke disasters that are more severe than fires on mineral lands. The smoke produced by peatland fires can spread far, creating serious health problems for nearby residents. Furthermore, fires on peatlands are much more dangerous because they release more carbon and other harmful substances into the atmosphere, which are detrimental to the environment and human health.

One informant who did not want to be named (2022) explained:

> "Not all officers, whom I do not want to say, understand how to put out a fire properly. Also, the endurance for extinguishing fires on peatlands is especially different. It could take days for the fire not to be extinguished or even spread. Special skills are needed, not just energy, but special skills to extinguish a fire. I once extinguished a fire on peatland during my week at the location because of the difficulty of extinguishing the area and the size of the fire. "This usually happens in deep peatlands, and the ecosystem has been damaged."

From the information presented above, it can be concluded that controlling forest and land fires is not trivial or simple. This is much more complicated than simply going out into the fields and spraying water on hot spots. Success in these firefighting efforts depends on thoroughly understanding highly specialized techniques and effective coordination between the parties involved.

The challenges are even greater if we talk about forest and land fires, especially those on peatlands. The extinguishing process in peatlands often takes days or even weeks for one fire. This is caused by several factors, including the flammable peat layer's thickness and fires that continue to burn below the ground surface. Riau, the province with the largest peatland in Indonesia, faces greater challenges in extinguishing fires. The location, which is rich in peat, makes fighting fires in this area even more complicated and challenging. These situations

require extra efforts involving more resources, personnel, and specialized equipment to extinguish the fire effectively.

6.3.2 Financial problem

Financial problems are often a classic obstacle in various public issues. When discussing budget allocations for preventing forest and land fires, we often ignore an aspect that is no less important, namely the financial incentives given to officers at the forefront of prevention efforts and fire fighting. This is very important because these officers are true heroes who sacrificed their energy, time, and lives in the field, fighting to extinguish the forest and land fires raging.

In this context, rewards and financial incentives are vital components in maintaining the morale and motivation of officers. They face situations full of risk and high pressure and often work in extreme conditions, including dealing with toxic fumes, hostile weather, and uncertainty about their safety. Therefore, paying proper tribute to their sacrifices is a very appropriate action and should be given priority.

Edwin Putra (2022), Coordinator of Manggala Agni Riau Province explained:

> “There must be more appreciation given to all officers in the field. Additional incentives and awards must be given to those who have fought on the front lines to extinguish the fire. They are heroes. "This incentive mechanism must be thought about in the future so that all personnel can be happy and more enthusiastic in carrying out their duties."

Someone who did not want to be named (2022) said:

> "In my opinion, a reward and punishment mechanism must be implemented. Officers such as Babinsa or bhabinkamtibmas who can work well without fires in their area are given special incentives and awards to be more motivated to prevent them. Then, for fellow officers who are in the field extinguishing fires in the field, extra attention must be given. Given adequate incentives to appreciate the services of those who have fought in the field."

These rewards can be financial incentives such as bonuses or special allowances. In addition, recognition of their services in the form of public awards, medals, or special awards will also provide a very meaningful emotional boost for officers. In addition to providing financial incentives and rewards, it is also important to provide them with adequate training and protection to reduce the physical and health risks they face while serving on the front lines.

On the other hand, Yuneldi (2022), Head of the Fire Department of PT. RAPP (April Group) said that:

> "We are running a Fire Free Village program where for our assisted villages where there are no forest and land fires in areas where fires frequently occurred previously, we assist 100-200 million in the form of goods or infrastructure needed by the community."

This mechanism represents a positive and effective step in incentivizing people living in areas prone to forest and land fires. PT. RAPP has implemented the "Fire Free Village" program for villages in the company's target area. In this program, PT. RAPP assists 100-200 million rupiahs in the form of goods or infrastructure needed by the community.

This incentive mechanism is a clear example of how companies can play an active role in efforts to prevent forest and land fires—not just talking, PT. RAPP has proven its concern with concrete actions that directly benefit local communities by assisting in the form of tools or infrastructure, PT. RAPP not only provides financial assistance but also helps communities to increase their capacity to face fire risks. The "Fire Free Village" program results have proven successful in various villages that are part of their program. Not only as a financial incentive, this assistance also motivates village residents to play an active role in fire prevention. They feel appreciated and supported in their efforts to keep their environment safe from the threat of forest and land fires.

6.3.3 The lack of accountability and transparency

The lack of accountability and transparency here is related to the lack of transparency regarding law enforcement results. Non-transparency and lack of accountability in law enforcement concerning forest and land fires have become serious problems affecting the effectiveness of prevention and law enforcement efforts. In particular, concerns arise regarding the lack of clarity regarding the results of law enforcement efforts carried out by law enforcement officials, such as the police, prosecutors, central government and regional governments.

Until now, there is still uncertainty in determining who is a suspect in forest and land fire cases, whether individuals or corporations. This lack of clarity results in legal uncertainty and opens up illegal practices that damage the natural environment. Even when sanctions are imposed, these sanctions are often considered weak and do not have a sufficient deterrent effect. Sometimes, sanctions are only a form of mild administrative reprimand that cannot stem the destructive practices that have occurred.

In addition, the legal process and enforcement of sanctions are also often volatile and inconsistent. Some cases may end in harsh sanctions, while others may only result in a mild warning. This creates legal uncertainty that can damage public trust in the law enforcement system.

One person who did not want to be named (2022) stated:

> “The government seems to be half-hearted in enforcing the law on individuals and corporations involved in burning forests and land. Sometimes, someone has been named a suspect, but the sanctions are still too light; sometimes, it is just an administrative reprimand. Moreover, the most important thing is that there is still minimal information and publications regarding who is involved in burning forests and land in various regions. "Sometimes, we even hear this information from the media or NGOs which monitor these issues closely."

This reflects the government's attitude in enforcing the law against individuals and corporations burning forests and land. Sometimes, suspects have been named,

but the sanctions imposed are still considered too light, sometimes only as an administrative warning. What is more worrying is the lack of information and publications circulating regarding individuals and entities involved in burning forests and land in various regions. Such information is often found in the media and NGOs closely monitoring environmental issues. Further problems related to this are discussed in the next sub-section entitled Weak Law Enforcement in Controlling Forest and Land Fires

5.4 Weak law enforcement issues

When discussing factors that are still weak in collaborative efforts to control forest and land fires in Indonesia, the main focus is on law enforcement. Law enforcement in forest and land fires in Indonesia has not yet reached an adequate level. There are two main factors carnified as the leading causes of weak law enforcement, namely the lack of firm action against perpetrators of forest and land fire cases and limited access to information about law enforcement. These two factors remain serious challenges for law enforcement officials in Indonesia.

Controlling forest and land fires in Indonesia involves various law enforcement agencies. The police, together with the Directorate General of Law Enforcement of the Ministry of Environment and Forestry, play an essential role in arresting and investigating cases related to forest and land fires. In addition, the Attorney General's Office of the Republic of Indonesia is responsible for prosecuting suspects involved in the legal process. Both central government authorities and regional governments have jurisdiction in imposing administrative sanctions. Although cooperation between various law enforcement agencies looks strong on paper, the real challenge lies in implementation. The lack of firm action against perpetrators of forest and land fire cases creates uncertainty and a lack of effectiveness in law enforcement. Meanwhile, limited access to information about the law enforcement process makes public monitoring and transparency difficult, and laws are weak.

The main problem in law enforcement cases related to forest and land fires is the lack of firm action from the government in imposing sanctions on perpetrators who have been proven guilty. This situation has created a belief among communities and companies that they can easily carry out deliberate forest fires or be negligent in keeping fires away from their concession areas without significant risk. Even if they are involved in a fire case, the perpetrators often do not feel afraid of the sanctions that the government will impose.

6.4.1 The government's indecisiveness towards perpetrators of forest and land burning

The government's lack of firmness in dealing with perpetrators of forest and land fires undermines the deterrent effect of the law. This causes them not to be afraid to continue their behavior. Regardless of whether their cases are investigated, or they stop committing violations, the government often does not provide adequate sanctions, whether in administrative, civil,l or criminal forms.

This argument is not just an argument, but it is based on several findings. The source who did not want to be named (2022) explained:

> "Law enforcement in Indonesia is a big homework for which a solution must be found immediately. There must be a firm commitment from the government to investigate individuals, especially companies that are proven to be intentionally or negligent in protecting their concession land. The government must have a deterrent effect on them."

This statement is further supported by data obtained from the Greenpeace 2020 Report. First is data that shows how weak law enforcement is against palm oil companies that have problems regarding forest and land fires in Indonesia (Greenpeace Southeast Asia- Indonesia, 2020).

Table 11. 10 palm oil companies ranked by total area burned in their concession areas from 2015-2019. (Source: Greenpeace Southeast Asia- Indonesia, 2020)

No	**Palm Oil Company**	**Companies Group**	**Fire Area (in Hectares)**		**Sanctions**	
			2015-2018	2019	2015-2018	2019
1.	PT Samora Jaya Usaha	Sungai Budi/Tunas Baru Lampung	26.600	17.500		
2.	PT Katingan Mujur Sentosa	LIPPO/Agro Inti Semesta	13.700	1000		
3.	PT Globalindo Agung Lestari	Genting	12.300	1000		
4.	PT Rezeki Alam Semesta Raya	Soeci	10.800	10.000		
5.	PT Bangun Cipta Mitra Perkasa	Best Agro Plantation	10.400	7.200		
6.	PT Dendymaker Indah Lestari	SIPEF	7.000	3.700		

7.	PT Mekar Karya Kahuripan	MAKIN	6.300	6.000		
8.	PT Arrtu Energie Resources	Rajawali / Eagle High	6.100	5.800		2
9.	PT Bulungan Citra Agro Persada	TSH Resources	6.100	4.300	1	1
10.	PT Karya Luhur Sejati	Best Agro Plantation	6.000	3.600		

From the data in table 11, we can see that only two companies have been subject to government sanctions or enforcement processes. These are PT Artru Energie Resources (Rajawali/Eagle High), which received two sanctions in 2019, and PT Bulungan Citra Agro Persada (TSH Resources), which received one sanction in 2015-2018 and one in 2019. Despite the sanctions given to these companies, the data does not provide a clear picture of the types and magnitude of sanctions imposed.

Furthermore, suppose we refer to the data table previously presented, which includes 10 companies in Indonesia with concession areas affected by forest and land fires. In that case, this additional data confirms that the Indonesian government appears to be very weak in taking action against companies with fire problems in their concession areas. This is even more striking when we consider the regulation issued by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency, Regulation No. 15/2016.

This regulation has explicit provisions regarding the actions that the government should take against companies with burnt concession areas. If the burnt area is below 50 percent of the company's total concession area, the government should revoke the license of part of the concession area. Conversely, if the burned area reaches more than 50 percent of the total concession area, the

government should revoke the license entirely or impose a fine of IDR 1 billion per hectare of burned land. However, the data provided shows that implementing this regulation does not seem to be effective. Of the 10 companies affected by forest and land fires, many of them still have not received strict action or sanctions by the regulation.

Table 12. Palm oil companies with more than 50 percent of their area burned in 2019 (Source: Greenpeace Southeast Asia- Indonesia, 2020)

No	Palm Oil Company	Companies Group	Concession area	Fires Area in 2019	Percentage of fires	Potential Fines (in Trillions of Rupiah)	Sanctions	
							2015-2018	2019
1.	PT Bulungan Citra Agro Persada	TSH Resources	5.218	2.908	56%	2,908	1	
2.	PT Proteksindo Usaha Mulia	Cempaka Mas Abadi	1.971	1.153	59%	1,153		
3.	PT Selatan Makmur Agro Lestari	Sriwijaya Palm Oil	1.101	701	64%	0,761		
4.	PT Borneo Indo Tani		1.034	636	62%	0,636		2
5.	Koperasi Tanjung Pawan Mandiri		636	537	56%	0,357		
TOTAL			9.960	5.755				

Table 12 is about the five oil palm companies that experienced forest and land fires in their concession areas of more than 50 percent, including those that experienced repeated fires in the same areas that had burned previously, only two were identified as having received sanctions from the government. These companies are PT Bulungan Citra Agro Persada, which received one sanction between 2015 and 2019, and PT Borneo Indah, which received two sanctions from the government in 2019. As stipulated in the regulation, companies with more than 50 percent of their concession area burned should be sanctioned to pay a fire fine of IDR 1 billion per hectare or have their business license revoked. However, the realization of the sanctions imposed on the two companies remains unclear.

Table 13. Palm oil companies with more than 1000 hectares but less than 50% of the area burned (Source: Greenpeace Southeast Asia- Indonesia, 2020)

No	**Palm Oil Company**	**Palm Oil Company**	**Concession area**	**Fires are in 2019**	**Percentage of Fires**	**Sanctions**	
						2015-2018	2019
1.	PT Dendy Marker Indah Lestari	SIPEF	17.213	3.749	22%		
2.	PT Platindo Agro Subur		12.225	3.478	29%		
3.	PT Sumber Alam Selaras	NPC Resources	7.899	2.286	29%		
4.	PT Kintap Jaya Wantindo	Jaya Agra Wattie	5.991	2.127	36%		
5.	PT Tri Setia Usaha Mandiri		5.875	1.785	30%		
6.	PT Primata Kreasimas	Bakrie	11.165	1.669	15%		
7.	PT Monrad Intan Barakat	Bakrie	3.958	1.669	42%		2
8.	PT Monrad Intan Barakat	Bakrie	3.999	1.505	38%		2
9.	PT Agrolestari Mandiri	Sinar Mas	6.278	1.361	22%		

10.	PT Sawit Sukses Sejahtera	Rajawali / Eagle High	11.188	1.021	9%

As can be seen in table 13 above, there are 10 companies with concession permits that have an area of more than 1,000 hectares, where the burned concession area is below 50 percent of the total area owned by the permit. However, in this data, only one company, namely PT Monrad Intan Barakat, was recorded as having received a total of 4 sanctions from the government. Interestingly, PT Monrad Intan Barakat should only be subject to permit revocation in burned areas, but until now, the realization of the implementation of these sanctions is still unclear.

However, it should be noted that companies involved in forest and land fires are not limited to palm oil companies. The data shows that companies in the pulp and paper industry also have similar problems. Many companies in the forestry sector have been found to have concession areas that have experienced fires.

Table 14 (see below) depicts ten pulp and paper industry companies ranked based on the area burned in their companies. From this data, it can be observed that the sanctions given by the government are evenly distributed to most companies, with only one company exempt from sanctions, namely PT Selaras Inti Sentosa, which is part of the Medco Group. Sanctions implemented by the government include administrative sanctions and operational sanctions. Several company permits were also revoked, although they were later given back after the companies improved their governance and complied with the rules set by the government.

Table 14. Ten pulp and paper industry companies ranked based on the area burned in their companies (Source: Greenpeace Southeast Asia- Indonesia, 2020)

No	Forestry industry companies (pulp and paper)	Company group	2019 Fire Area (Hectares)		Fire Percentage		Sanctions	
			2015-2018	2019	2019	Recurring fires 2015-2019	2015-2018	2019
1.	PT Bumi Mekar Hijau	Sinar Mas /APP Afiliated	87.600	40.400	46%	19%	2	
2.	PT Bumi Andalas Permai	Sinar Mas /APP Afiliated	84.400	11.400	13%	10 %	2	
3.	PT Musi Hutan Persada	Marubeni	74.100	5.600	8%	7%	1	
4.	PT Sebangun Bumi Andalas Wood Industries	Sinar Mas /APP Afiliated	52.000	7.200	14%	6%	1	
5.	PT Sumatera Riang Lestari	APRIL GROUP/Royal Golden Eagle Affiliated	21.000	6.700	32%	7%	1	
6.	PT Paramitra Mulia Langgeng	Sungai Budi	16.700	9.600	58%	48%	1	1
7.	PT Selaras Inti Semesta	Medco	15.000	2.800	18%	29%		
8.	PT Arara Abadi	Sinar Mas / APP Afiliated	12.300	1.400	11%	5%	1	
9.	PT Sumatera Sylva Lestari	APRIL Group/ Royal Golden	12.000	400	3%	13%	2	

		Eagle Affiliated					
10.	PT Rimba Hutan Mas	Sinar Mas/ APP Afiliated	10.500	1.400	14%	7%	1

In the explanation above, it can also be seen that two large companies are one of the largest pulp and paper producers, not only in Indonesia but also in Asia, namely APP (Sinar Mas Group) and APRIL Group. However, it should be emphasized that the companies proven to be involved in forest burning are not companies that are directly auspices of the group. Instead, these companies act more as a raw material supply for the large group. In other words, there is a connection between the company that burned down and these two giant groups, even though legally, they operate separately.

A striking anomaly is that based on findings and interviews with one of the large groups, namely APRIL Group, there is clear evidence that they have implemented "zero burning" practices in their company area with various positive programs, such as fire-free village programs, fire extinguishing equipment state-of-the-art, comprehensive resources, independent satellite monitoring technology, and sophisticated monitoring cameras to monitor all concession areas under their group. However, on the other hand, there is still a serious problem, namely that they still get their raw material supplies from companies that have poor environmental records. This creates an anomaly that must be addressed.

Yuneldi (2022), Head of the PT RAPP (APRIL GROUP) Fire Department, explained:

> "You have seen and can judge for yourself how complete our equipment is and how qualified our human resources are in preventing fires in our concession areas. We are serious and fully committed to preventing forest and land fires in our area. We also continue to carry out other programs, such as fire-free villages and others, so that fires and land fires can be

> minimized in other places. We also help the government to extinguish fires in the locations they need"

Mr Ian (2022). The manager of the Fire and Safety Division at PT RAPP explained:

> “You see firsthand how our monitoring technology can prevent forest and land fires. We invested tens of billions of rupiahs in applying high-level technology, such as concession area monitoring cameras, our exclusive company satellite data, and advanced technology such as drones, to directly monitor potential fires. This is a form of our commitment to preventing forest and land fires in our concession areas."

This highlights the importance of ensuring sustainable and ethical supply chains so that companies that adhere to strict environmental standards do not engage with suppliers that violate environmental principles. Large companies like APP and APRIL need to work harder together to ensure that their entire supply chain adheres to sustainable practices and does not harm the environment. This will help maintain the sustainability of the natural environment and local communities and reduce the negative impact of forest and land fires in Indonesia.

6.4.2 Low transparency in law enforcement

Lack of transparency in law enforcement in forest and land fires is a severe problem that illustrates the government's weakness in law enforcement issues. The government seems reluctant to disclose information regarding this case to the public, resulting in uncertainty and distrust in society. As a result, the issue of forests and l in Indonesia has never been entirely resolved.

The importance of transparency in law enforcement cannot be ignored. This is not only related to the issue of forest and land fires but also to public trust in the government and the justice system. When the government is not transparent in providing information regarding perpetrators and suspects of forest and land fires, this can shake public confidence that law enforcement is carried out fairly and without selective logging.

Someone who did not want to be named (2022) explained:

> "The issue of transparency is the main problem of forest and land fires in Indonesia. The government is not open and tends to be half-hearted in investigating cases of forest and land fires on corporate lands. This is emotional Homework. It is going to be finished soon".

Along with that, it is also essential to recognize that this lack of transparency is not just a government problem. Non-governmental organizations such as Greenpeace Indonesia have made great efforts to collect accurate data and information regarding the problem of forest and land fires. However, their efforts are often limited by limited access to data. This lack of transparency not only hampers the efforts of these organizations to provide adequate support in addressing this issue but also makes it difficult for the public to understand the complete picture of the problem and puts pressure on the government to act.

To overcome this problem, the government needs to prioritize transparency in law enforcement. This includes disclosing information regarding perpetrators and suspects of forest and land fires clearly and openly to the public. In addition, the government must also commit to providing better access to non-governmental organizations and the general public in accessing relevant data.

The importance of transparency is also closely related to the root of the problem of forest and land fires in Indonesia. When law enforcement is not transparent, environmental crime perpetrators can feel safe and free to continue their activities. This creates a cycle where forest and land fires continue to recur without adequate law enforcement. Therefore, the government must immediately address this lack of transparency as one of the first steps in overcoming the problem of forest and land fires.

In addition, it is essential to involve all stakeholders, including the community, in the law enforcement process and monitoring of forest and land fire issues. By involving the community and non-government organizations in monitoring and

reporting fire incidents, the government can obtain more accurate and reliable information, as well as strengthen cooperation between the government and the community in dealing with this problem.

Overall, the lack of transparency in law enforcement is one of the main obstacles in handling the problem of forest and land fires in Indonesia. The government must immediately take action to increase transparency and address this problem seriously. Only with high transparency, effective law enforcement, and active community participation can the issue of forest and land fires be handled effectively and sustainably.

5.5 Rent-seeking and corruption issue

The lack of transparency and weak law enforcement, as discussed previously, shows a strong indication that there are parties who are trying to protect themselves in cases of forest and land fires in their concession areas. This rent-seeking practice can take the form of bribes to officials or law enforcers. These indications are solid. When we look at corporate licensing or fines imposed on large companies, they look for shortcuts to avoid these sanctions.

Rent seekers also continue to use the burn-in method in their production activities as it is more cost-effective and helps them save a large budget, resulting in greater profits. Research conducted by Purnomo et al. (2017) explained that the method of clearing land by burning is indeed cheaper and faster than the method that should be used, namely, using heavy equipment. Clearing land in this way makes many individuals use it to plant crops. Purnomo et al. (2017) also explained that there are many parties involved in this practice, especially several individuals in government, especially at the regional or village government level, and law enforcement officials who are involved and aware of this action. In his findings, local elites received 68% of the income, while individuals who burned the land received 22%. The village elite who handles land documents gets 10%. This

explains that the local elite are indeed the biggest beneficiaries in the case of forest and land fires in Indonesia.

Then, this argument becomes even stronger if we look at the broader context of forestry and oil palm plantation issues. In Indonesia, it is known that cases of bribery in permits related to forestry and palm oil are very prone to corruption, and there is much evidence. Even in Riau itself, many regional heads, starting from the regent and governor level, have become defendants, and been found guilty because they were involved in bribery involving permits in the forestry and palm oil plantation sectors.

List of high-ranking officials in Riau who were accused and found guilty in cases related to forestry and oil palm plantations.

Table 15. List of high-ranking officials in Riau who were accused and found guilty in cases related to forestry and oil palm plantations (source: processed it from various sources)

No.	Name	Position	Corruption Case	Court Verdict
1.	Rusli Zainal	Governor of Riau Province 2004-2013	Bribery related to granting Business Permits for the Utilization of Plantation Forest Timber Products	10 years in prison
2.	Annas Maamun	Governor of Riau Province 2014-2016	Bribery related to processing the transition of industrial forest status (HTI) covering an area of 140 hectares in Kuantan Singingi Regency, Riau.	6 years in prison
3.	T. Azmun Jaafar	Regent of Pelalawan Regency 2001-2009	Guilty of issuing a business permit for using timber-plantation forest products or IUPHHK-HT, resulting in forest destruction in	11 years in prison

			Pelalawan.	
4.	Arwin AS	Regent of Siak Regency 2001-2011	natural forest management permits to be converted into industrial forest plantations.	4 years 6 months in prison
5.	Burhanudin Husin	Bupati Kabupaten Kampar 2005-2011	corruption in issuing Business Permits for the Utilization of Plantation Forest Timber Products (IUPHHK-HT) in several companies.	2.5 years in prison
6.	Asral Rachman	Former Head of the Riau Province Forest Service	Regarding permits to release forest areas into industrial forest plantations	5 years in prison
7.	Syuhada Tasman	Former Head of the Riau Province Forest Service	Bribery related to forestry permits	5 years in prison
8.	Andi Putra	Regent of Kuantan Singingi Regency in 2021	Bribery related to permission to extend the Cultivation Rights for Palm Oil Plantations.	4 years in prison

Table 15 shows that there are 2 former governors of Riau, 4 regents, and 2 heads of the Riau provincial forestry service who have problems related to corruption in the forestry and plantation sectors. This data is data where only the main actors who hold necessary authority in these permits are displayed. The data found above concludes that forestry and plantation issues are issues that become wetlands for committing criminal acts of corruption. Of course, the findings above explain strong indications related to the problem of forest and land fires in Riau and Indonesia.

5.6 Responsibility of neighboring countries

Malaysia and Singapore, as Indonesia's neighbors bordering areas seriously affected by forest and land fires, such as those near the islands of Sumatra and

Kalimantan, consistently voice their concerns to the Indonesian government every year. These protests can be both official protests and unofficial communications. These protests are made because forest and land fires in Indonesia have severe impacts that involve many aspects of daily life. Forest and land fires in Indonesia often disrupt flights, resulting in flight cancellations or delays due to the thick haze. Children are often unable to go to school due to poor air quality. In addition, health impacts due to smoke exposure are also a severe problem, and local economies are disrupted due to the losses incurred by forest and land fires.

However, this needs to be scrutinized again because it is evident that companies from Singapore and Malaysia have a significant role in exacerbating forest and land fires in Indonesia. There are companies registered in their countries that are responsible for burning forests and land in their concession areas. Their companies also have legal problems related to forest and land fires that occurred in Indonesia. This was clearly stated by Ridho Rasio Sani, former Director General of Law Enforcement of the Ministry of Environment and Forestry (Simanjuntak, 2019), who investigated cases of severe forest and land fires that occurred in 2019, said.

> "As of October 1, 2019, his office has sealed 64 companies in the location of forest and land fires. A total of 20 concession areas that were sealed, he said, belonged to foreign companies. Among them are companies from Malaysia, Singapore and Hong Kong. "In addition, there are Indonesian companies, but the directors are Malaysian or Singaporean citizens."

The above statement illustrates how complex the problem of forest and land fires in Indonesia is. In fact, not just one or two but a number of companies from Malaysia and Singapore have been proven to be involved in the practice of burning forests and land. This creates a very ironic situation, where neighboring countries often emphasize the need for Indonesia to resolve these cases. On the other hand, companies from their own countries are part of the problem that harms the environment.

To address this issue, cross-border cooperation and collaboration is crucial. Indonesia may have specific legal instruments to stop forest and land fires. However, the Malaysian and Singaporean governments' assertiveness towards companies from their countries involved in cases in Indonesia must also be realized. Strict sanctions and penalties must be applied to ensure these companies do not repeat environmentally destructive practices.

This is not only an ethical issue but also a moral issue for the neighboring countries. They must commit to solving this problem together. Protests and criticism are not enough, and neighboring countries must also provide constructive support to Indonesia and make clear rules for companies from their countries investing in Indonesia. This will create a solid legal basis to ensure that environmentally harmful practices do not occur again. It is a shared responsibility to maintain environmental sustainability and the regional economy.

5.7 Barriers beyond collaboration: Economic, Social and Political Issues

5.7.1 Economic issues

The government's reluctance to take firm action against parties involved in forest and land fires, such as revoking business permits or land use permits, is often faced with economic dilemmas, especially in areas highly dependent on palm oil and the pulp and paper industry. Riau is an example that illustrates the gap between strict policymaking and economic considerations, as evidenced by Gross Regional Domestic Product (GRDP) data, which shows significant dependence on the palm oil and forestry sectors.

My previous research (Wicaksono, 2019) found that the forestry industry (HTI) in Riau has a vital role in the economy. For example, PT RAPP, which since 1999 has contributed IDR 2.45 trillion to the state, includes taxes and GNP. Apart from that, Riau Province also received additional funds amounting to IDR 758.59 billion. In the same period, RAPP has contributed IDR 557

trillion to the national economy, with 89.5% channeled to Riau. The HTI industry directly employs at least 5,500 workers and indirectly contributes to the employment of up to 58,000 people in Riau Province.

The palm oil industry, a mainstay commodity in Riau, has also been impacted by the progress of the grass restoration program. Riau has the most extensive oil palm plantations in Indonesia, covering 25% of the territory and accounting for 25% of the total oil palm plantations in Indonesia. The palm oil industry employs around 5.7 million people, and 2.2 million are small-scale farmers. As a major palm oil producer, Riau employs more than 1 million workers.

The strong relationship between GRDP and these industries makes it difficult for the government to take firm action against companies involved in forest and land fires. Revocation of business permits or land use permits can have quite a sizeable economic impact on these areas, considering that these companies are significant contributors to the formation of GRDP. Riau is an example of the complex relationship between economic prosperity and the palm oil and forestry industries.

Even in my research (Wicaksono, 2019), the events of 2018, when employees at PT RAPP demonstrated against the government's rejection of the Work Plan (RKU), illustrate complex dynamics involving the government, companies, and the world of work. The government's decision to seek a middle way shows how economic pressures can influence the government's attitude in dealing with problematic companies.

5.7.2 Social issues

This social issue includes the habit of small farming communities who burn land for agricultural activities, whether for oil palm or other crops. Although the number of fires originating from this practice tends to be lower than that of

large companies, the impact is still significant and can potentially cause widespread fires. Small farming communities that burn land for farming, both for oil palm and other crops, often do so as a traditional method to clear land for cultivation. However, this practice can lead to releasing harmful greenhouse gases and destroying valuable ecosystems. Finding sustainable alternatives and providing education and support to these communities is crucial to prevent further environmental damage. Oil palm and other crops seriously threaten environmental sustainability and public health.

Interview with Budi Hidayat (2022), Head of the Kampar Kiri Forest Management Unit said:

> "There are also some people who farm and still use the burning method to clear the land due to hereditary factors. Their customs are like that. “

This behaviour is a danger that requires preventive action and more in-depth education. Although fires originating in small farming communities tend to be smaller in scale, their significant numbers can cause large losses. Land fires carried out by small farmers can harm land productivity, destroy ecosystems, and threaten the survival of various flora and fauna.

The importance of stopping or at least understanding more deeply the habit of burning land by small farming communities demands a holistic approach. Providing an in-depth understanding of the negative impacts of this practice, both from an environmental and economic perspective, needs to be intensified. Education and training programs that focus on alternative agricultural techniques that are environmentally friendly and sustainable can be a practical first step.

5.7.3 Political issues

Regional leaders exhibit a steadfast commitment to fostering prosperity among their constituents and ensuring the sustainability of the local economy. However, within a context where the Gross Regional Domestic Product (GRDP) heavily relies on the forestry and palm oil sectors, democratically elected regional heads often grapple with intricate dilemmas while executing their duties. While these industries serve as the economic backbone, they simultaneously exert pressure on regional leaders' decisions regarding the cessation or granting of permits to companies engaged in illicit practices. Notably, these leaders may display wavering resolve as their leadership term approaches its final 1-2 years, particularly when contemplating reelection during the upcoming general elections.

Considering GRDP as a pivotal gauge of regional economic success frequently presents a substantial obstacle. Regional leaders navigate the delicate balance between long-term and short-term interests, where the aspirations for community welfare and economic growth must align harmoniously with environmental preservation. Confronted with this intricate scenario, decisions concerning permits for companies with proven legal violations are approached judiciously to avert adverse repercussions on GRDP and the broader economy.

Interview with Made Ali (2022) Executive Director Kalaulahari said:

> "Corruption in the forestry and plantation sectors is one of the things that makes the problem of forest and land fires in Indonesia never resolved."

Furthermore, the spectre of Corruption, Collusion, and Nepotism (KKN) looms large as a connected challenge. KKN practices cast a shadow on the decision-making processes of regional heads regarding company licensing. The involvement of unscrupulous actors can compromise transparency and accountability in dealing with rogue enterprises. Consequently, proactive

measures and decisive actions against KKN practices are paramount to ensure regional leadership's effective functioning.

5.8 Has collaborative governance failed?

The question arises: Has collaborative governance failed and cannot effectively address the problem of forest and land fires? The answer is no. In fact, collaborative governance has significantly impacted the control of forest and land fires in Indonesia. By harnessing the collective power of multiple stakeholders, each with unique backgrounds and expertise, collaborative governance has made controlling forest and land fires more feasible through shared responsibility.

Several interviewees, such as Edwin Putra (2022), coordinator of Riau Province's Manggala Agni under the Ministry of Environment and Forestry, echoed this. He said,

> "Before there was an affirmation from the government that forest and land fires are a shared responsibility, we from the Ministry of Forestry and Environment were always blamed whenever uncontrolled forest and land fires occurred. However, our efforts have become much more manageable as we jointly collaborate with other agencies to fight these fires. This has certainly lightened our workload."

Budi Hidayat (2022). The head of the Kampar Kiri Forest Management Unit echoed the same sentiment:

> "As the agency responsible for forestry affairs at the local level, we appreciate the collaboration between various stakeholders in controlling forest and land fires. In addition to additional firefighting personnel and personnel dedicated to raising awareness about the dangers of land burning, joint budgeting also significantly eases the burden."

Indeed, significant hurdles must be overcome to establish effective multi-stakeholder collaboration in the context of forest and land fire control. As elaborated in the preceding section, these challenges require swift and resolute action to refine and amplify the ongoing collaborative initiatives.

It is noteworthy that significant alterations in forest and land fire control have occurred after the 2015 fires. These modifications are believed to have positively influenced and substantially enhanced attempts to manage forest and land fires.

1. Specific and firm rules that clarify the framework for multi-stakeholder collaboration between various parties from different backgrounds. Previously, forest and land fires were practically the sole responsibility of the Ministry of Environment and Forestry (at the center), the Environment and Forestry Agency (at the regions), the National Disaster Management Agency (at the center), and the Regional Disaster Management Agency (at the regions). Almost all stakeholders have the same responsibility and work together to solve the problem.
2. Forest and land fire control task forces are at every level, from the central government, provincial government, district/city government to the village level. The task force is a collaborative house that runs the decision-making process and is a coordination node for all stakeholders.
3. A bottom-up decision-making approach, followed by command implementation, marks creating a good, effective, efficient collaborative governance process. By allowing for the active participation of all stakeholders in policy formulation and implementation, this approach successfully addresses the gap between top-level decisions and implementation on the ground.
4. A real-time forest and land fire monitoring system called the Sipongi System helps to improve multi-stakeholder collaboration in fire disaster management. With accurate and continuous data and information, all parties involved can take quick and appropriate actions according to the conditions on the ground.

It can be said that collaborative governance has not failed, but it is not perfect; improvements can be made, though they require additional effort. This corresponds with the weaknesses of collaborative governance identified in the

preceding section. Recommendations will be presented to improve the current collaborative governance, which will be addressed in the subsequent section.

5.9 Exit way in forest and land fire control: Recommendations.

Based on the explanations presented in the previous section, a solution has been formulated to address the issues of forest and land fires while enhancing the collaborative framework established by the government and other stakeholders. This solution is divided into five main recommendation points.

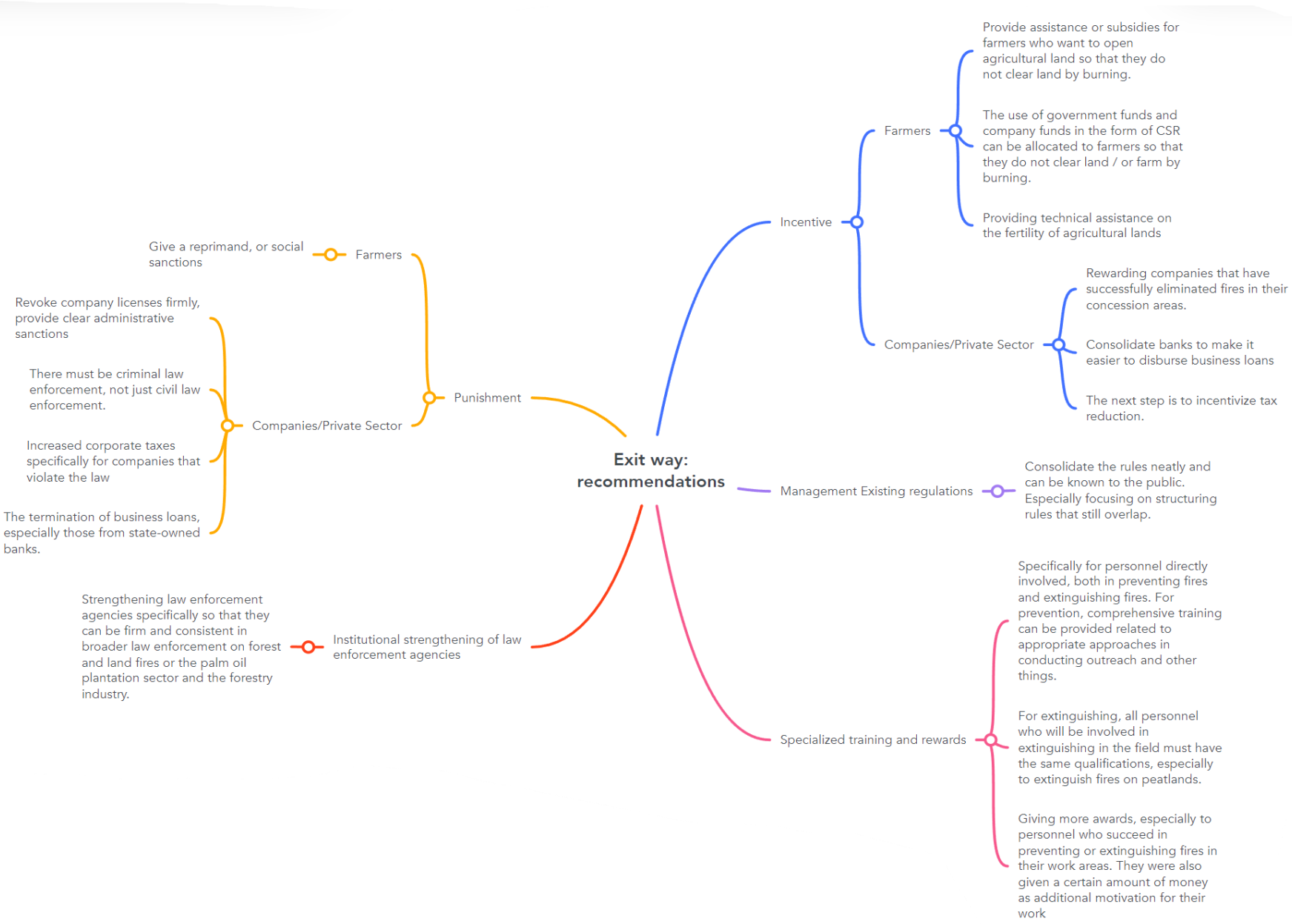


Figure 9. Exit way: 5 points of recommendation for solving Indonesia's forest and ground fires problem

1. Incentive

   In forest and land fire prevention, implementing incentives is a critical foundation that can involve farmers and companies in collective efforts. First, for farmers, incentives can take the form of grants or cost subsidies, encouraging them to choose more sustainable farming methods rather than clearing land by burning. The government can allocate funds from the government budget or encourage companies to contribute their CSR funds to support farmers in the sustainability of their agriculture. Furthermore, a technical assistance approach is essential to overcome the perception that land burning can increase fertility. Providing farmers with training and technical resources on sustainable and environmentally friendly farming practices can provide a better understanding of how to increase soil fertility without relying on detrimental burning methods. This initial step can focus on areas prone to forest and land fires.

   Meanwhile, awards and public recognition can be an effective incentive for companies that succeed in preventing the spread of fire in their concession areas. This award can be given openly and widely to provide positive encouragement to companies that have contributed to preserving the environment. Furthermore, providing economic incentives, such as easy access to business credit and reduced corporate taxes, can strongly encourage companies to adopt good fire management practices. In this case, transparency and accountability are essential. Incentive mechanisms must be carefully designed to encourage sustainable behavior and not provide the wrong incentives. If implemented carefully, these steps can form a solid foundation for effective multistakeholder collaboration in addressing the challenge of forest and land fires in Indonesia.

2. Punishment

   The second recommendation is related to the application of sanctions or penalties, which is a critical aspect of maintaining compliance by farmers and companies with the principles of preventing forest and land fires. For farmers,

sanctions can be directed at warnings and social sanctions that directly impact their reputation and social involvement in the local community. This choice aligns with a constructive approach to understanding and concrete solutions for more sustainable agricultural practices. Criminalizing, the absence of criminal sanctions at the farmer level can be understood as a response to society's need for constructive solutions.

When solutions that offer incentives, as outlined in the previous recommendations, are met, the likelihood of farmers adhering to sustainable farming guidelines and practices is higher. Meanwhile, for companies involved in burning land, the application of sanctions must be stricter. Revocation of operational permits as an administrative sanction is a significant option, sending a strong signal that serious rule violations will result in severe consequences. This step can also be accompanied by further investigations up to the level of criminal sanctions, involving not only the direct perpetrator of the arson but also the individual responsible for ordering or organizing the action. In addition, implementing sanctions by increasing business taxes can be an effective instrument to encourage companies to comply more with sustainable rules and practices. This effort can be carried out carefully to avoid detrimental impacts on the regional or national economy. Additionally, stopping or complicating companies' access to business credit, primarily through state-owned banks, can effectively sanction companies to change their behavior towards more environmentally responsible practices.

3. Institutional strengthening of law enforcement agencies

The main highlight of the third recommendation is the importance of strengthening law enforcement agencies and institutions, especially in handling environmental cases such as forest and land fires. Facing recurring problems, comprehensive reform of law enforcement institutions is needed to make them more responsive and effective in dealing with the impacts of forest and land fires. The issue of lack of accountability and transparency, especially

among law enforcement officials, is a serious obstacle that needs to be overcome.

First, increasing law enforcement officers' capacity and special expertise is critical. Continuous training, in-depth understanding of forest and land fire dynamics, and increasing sensitivity to environmental issues must be a priority. Collaboration with environmental experts and other related parties can ensure holistic case handling. Cooperation between law enforcement officials, local governments and related agencies must be improved to speed up case handling and implement law enforcement policies effectively. Even though it has been regulated in the forest and land fire control task force, its implementation must be evaluated to ensure success.

Apart from that, transparency and accountability need to be emphasized. Investigation of legal cases related to forest and land fires must be open to the public, ensuring openness and precise monitoring. This can also be an essential step in overcoming the problems of secrecy, collusion, corruption and nepotism (KKN), which are still significant challenges. By opening all cases clearly, the community can come together and participate actively in handling this crucial environmental problem.

4. Management existing regulations

The fourth recommendation emphasizes consolidating regulations directly related to forest and land fires from upstream to downstream. This process needs to begin by detailing and reformulating each rule involved and then arranging them in a structured and integrated manner. The first step is to formulate regulations related to forest and land fires from the central to the local level. Each regulation must be clearly outlined and organized to support each other without overlapping. Simplifying and consolidating these rules will create a more transparent framework that can be implemented effectively. Furthermore, the results of consolidating these regulations need to be well-socialized to the public. The socialization process must use language that is easy to understand and inclusive so that various levels of society can access it.

Influential publications will increase public awareness of these regulations and increase involvement in preventing and controlling forest and land fires.

5. Specialized training and rewards

   One of the critical challenges in multi-stakeholder efforts to prevent forest and land fires in Indonesia is a lack of knowledge, particularly regarding extinguishing fires on peatlands. To address this, specialized training is needed to focus on relevant and necessary techniques. Additionally, prevention strategies should include practical methods of disseminating information to targeted audiences. Moreover, it is crucial to provide appropriate incentives that increase motivation and engagement among personnel from diverse stakeholders. While monetary rewards can be practical, non-financial aspects such as recognition and appreciation are essential for fostering sustainable collaboration. We can establish a strong foundation for flourishing forest and land fire control efforts by prioritizing specialized training, effective outreach, and well-designed incentives. This also encourages solving problems related to financial problems in the previous section

The five recommendations above can be valuable considerations and input for the government and related stakeholders in collaborative efforts to control forest and land fires in Indonesia. Implementation of this strategy can be the basis for forming effective policies, ensuring the involvement of all relevant parties, and creating synergy between various stakeholders to overcome this severe challenge. Thus, this joint effort can significantly impact environmental conservation, community welfare, and the sustainability of forest and land ecosystems in Indonesia.

5.10 Conclusion

The strength of collaborative efforts in controlling forest and land fires lies in their ability to harness the full potential of multiple stakeholders, including

government agencies, non-governmental organizations, local communities, and private sector entities. By engaging these diverse actors, collaborative approaches aim to address the complexities of forest and land fire management with integrated and multifaceted strategies. However, despite these efforts, several significant challenges remain that require urgent attention. A prominent issue is the lack of adequate knowledge and capacity among many stakeholders, which hinders their ability to contribute effectively to prevention and management efforts. This gap is compounded by financial constraints, which limit the resources available for fire control initiatives, such as acquiring advanced technologies for fire detection, suppression, and prevention. Furthermore, there are persistent issues around accountability and transparency, both of which are essential to ensure that stakeholders remain committed to their roles and responsibilities.

Another major barrier to the success of collaborative efforts is the issue of weak law enforcement. While there are legal frameworks designed to govern forest and land management, their implementation is often patchy. This failure is compounded by deep-rooted corruption, collusion and nepotism (KKN) practices in the forestry and palm oil sectors. These practices undermine national and regional efforts to eradicate illegal activities such as land clearing by burning, thus worsening the fire situation. Without addressing these systemic issues, the sustainability of collaborative governance efforts will continue to be threatened.

In addition, recent findings reveal the involvement of companies from neighboring countries, such as Malaysia and Singapore, in forest and land fires in Indonesia. This adds an international dimension to the problem, highlighting the need for a stronger cross-border regulatory framework and cooperation to hold these companies accountable for their actions. The involvement of these foreign entities shows that the fire crisis is not limited to national borders, and thus requires a coordinated regional response.

6. Conclusions and Recommendations

6.1 Summary of the main findings

This section elucidates the principal findings that address the three research questions posited in this study. Firstly, in relation to the characteristics and primary causes of forest and land fires in Indonesia, the findings underscore the human factor as the predominant driver. The practice of land clearing for plantations, particularly for oil palm cultivation, emerges as the principal ignition source for fires. While natural factors such as El Niño play a contributory role by inducing drought conditions, their influence is primarily ancillary. These results elucidate those human activities, specifically the use of fire in land clearing, overwhelmingly contribute to the heightened risk of forest and land fires. The repercussions of these fires are severe, impacting the economy, the environment, and public health. Furthermore, it was identified that perpetrators of forest and land fires, particularly in the province of Riau, are affiliated with major corporations with expansive business networks. This issue thereby assumes the character of a "wicked problem," characterized by intricate and interconnected challenges.

Secondly, pertaining to the implementation of collaborative governance in forest and land fire control in Indonesia, it is discerned that, from a formal standpoint, the execution of collaborative governance has exhibited relative efficacy. Adequate regulatory frameworks are in place, institutional structures within task forces have been established, bottom-up decision-making mechanisms are operational, and there exists a command approach to decision implementation. This signifies considerable progress compared to the conditions preceding the severe forest and land fires in 2015. However, challenges persist, including suboptimal law enforcement and prevalent corruption within the forestry sector by select entities. Addressing these challenges necessitates intensified legal measures and enhanced transparency in natural resource management.

Thirdly, the challenges and opportunities in implementing collaborative governance in Indonesia's forest and land fire control are delineated. The potency of collaboration resides in the mobilization of diverse stakeholder potential towards forestalling such conflagrations. However, several deficiencies demand earnest consideration, notably the lack of knowledge among actors, financial constraints, and deficits in accountability and transparency. Additionally, the spectre of weak law enforcement looms large and necessitates immediate resolution. Instances of corruption, collusion, and nepotism (KKN) are pivotal concerns entangling the forestry sector and palm oil industry, exacerbating the forest and land fire scenario. Furthermore, revelations of a nexus between companies in Malaysia and Singapore and forest and land fires in their respective regions have surfaced. While the collaboration is not deemed a failure, it falls short of the aspired level of perfection. Consequently, five-point recommendations are proffered for the effective control of forest and land fires in Indonesia.

6.2 Limitations of the study

The limitations of this research need to be recognized as an integral part of the methodology applied. The field research was conducted over six months, from August 2022 to January 2023, which significantly affected the scope of data that could be obtained. Key data, particularly from interviews and observations, were limited by this timeframe, limiting an in-depth understanding of dynamics that may have changed over time. While efforts have been made to update data from various sources, such as documents and websites, to ensure the currency of information, it is still possible that some recent developments are not covered in this analysis. The fast-changing nature of the issues studied, especially in the context of forest and land fire management, marks a potential limitation in a comprehensive understanding of current dynamics.

6.3 Implications for policy and practice

This study aims to be a valuable resource and evaluation tool for policymakers. Hopefully, it will encourage the strengthening of more solid and effective multi-stakeholder collaboration in addressing the challenges of forest and land fire control in Indonesia. Practically, this research is expected to provide a solid basis for forming more efficient policies in dealing with the complexity of the forest and land fire problem. By involving various stakeholders, this study will provide in-depth insights into the root causes of forest and land fires and solutions for their prevention and suppression.

Furthermore, the study is expected to provide practical guidance to policymakers on coordinating and building cooperation among relevant agencies and stakeholders to face the problem of forest and land fires jointly. The results of this study are expected to result in more synergistic and practical cooperation in facing the serious challenges related to forest and land fires. Ultimately, the main goal of this research is to create positive, tangible impacts by reducing the frequency and adverse impacts of forest and land fires in Indonesia. Through a deeper understanding of the issue and a solid multi-stakeholder approach, it is hoped that a concerted and coordinated effort will be to preserve the environment, protect communities and maintain the balance of affected ecosystems.

6.4 Recommendations for future research

Following this study, it is essential to continue with another research. This follow-up research's primary focus should be tracking impeded law enforcement practices in Indonesia, especially in forestry and forest and land fire control. Furthermore, it is necessary to examine concrete measures to effectively combat corruption, collusion, and nepotism (KKN) in the forestry sector.

This follow-up research is expected to explore in more depth the obstacles that may occur in implementing law enforcement in the forestry sector and how this

impacts efforts to control forest and land fires. It is also expected to investigate the factors contributing to the persistence of corrupt practices in the forestry sector and propose concrete solutions to overcome this challenge.

Hopefully, the results of this follow-up research will significantly contribute to improving preventive measures and stricter law enforcement. This, in turn, can reduce the severe problems associated with forest and land fires while also ensuring the sustainability of the affected ecosystems. With this research, it is also hoped that more effective measures will be taken to sustain the environment and society.

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Appendix 1

Interview Guide

Name :

Position/Stakeholders :

Date :

Questions Regarding Forest and Land Fires

1. How do forest and land fires in Indonesia occur annually, and what are the main factors?

2. Can you explain the characteristics of forest and land fires in Indonesia?

3. What historical background do you have regarding forest and land fires?

4. What is the impact of forest and land fires?

5. Who are the main actors responsible for making forest and land fires, especially in Riau Province?

Questions Regarding Multistakeholder Collaboration in Fire Control

1. What regulations are the basis for implementing multi-stakeholder collaboration in controlling forest and land fires in Indonesia?

2. Who are the stakeholders at national and provincial levels involved in fire control, and what roles do they play?

3. How does your institution contribute to controlling forest and land fires?

4. Can you explain the decision-making process in the fire control task force?

5. How are decisions implemented in the fire control task force?

Questions Regarding the Challenges and Opportunities of Multistakeholder Collaboration in Fire Control

1. What obstacles do you think significantly impact multi-stakeholder collaboration in controlling forest and land fires?

2. Are there external challenges other than those faced during the collaboration, and if so, what are they?

3. In your opinion, what strengths emerge from implementing multi-party collaboration?

4. What is your view on the issue of corruption in forest and land fires in Indonesia and Riau?

5. In your opinion, has the collaboration been successful or is it still facing challenges?

6. What improvements are needed to make future collaboration more effective?

Note: This section should be flexible in responding to the interviewee's answers to gain deeper insights. The questions provided are guiding points, and the interviewer is encouraged to explore further based on the interviewee's responses.

Appendix 2

Photos while conducting field research.





SYSTEM
CHANGE
NOT
CLIMATE
CHANGE!


WAREHOUSE
FIRE AND AVIATION
DEPARTMENT


LEADERSHIP


POSKO
KEBAKARAN HUTAN DAN LAHAN
PT.RAPP BLOK PELALAWAN


REPUBLIK INDONESIA
JL TEUKU UMAR NO. 17
MENTENG JAKARTA PUSAT - 10350


MONITORING PENALATAN


BALAI PRIKOL WILAYAH SUMATERA
KOORDINATOR WILAYAH
MANGGALA AGNI
PROVINSI RIAU

Appendix 3

Detailed explanation of the duties and functions of the actors involved in controlling forest and land fires at Indonesian level

- Ministry of Environment and Forestry

As a government institution fully responsible for the environment and forestry, the Ministry of Environment and Forestry (MoEF) is the spearhead in controlling forest and land fires in Indonesia. Duties and responsibilities: the Ministry of Environment and Forestry is an essential stakeholder with important tasks. Monitoring and early detection of forest and land fires are a priority for MOEF in preventing fires in Indonesia. Using modern technology such as remote sensing, drones, and the Sipongi application, MOEF can quickly and efficiently identify hotspots.[7] In addition, MOEF has a vital role in fire prevention by implementing various preventive measures. These measures include the creation of fire lanes, environmentally friendly land management, and public education on the dangers and prevention of forest and land fires.

To coordinate fire management, MoEF works closely with related parties, such as BNPB, TNI/POLRI, and local governments, to ensure integrated and effective handling. Restoring burnt land involves MOEF's role in reforestation and revegetation, while law enforcement includes imposing sanctions according to the violations committed by fire perpetrators.

[7] Area with high fire potential due to dry vegetation, high temps, low humidity.

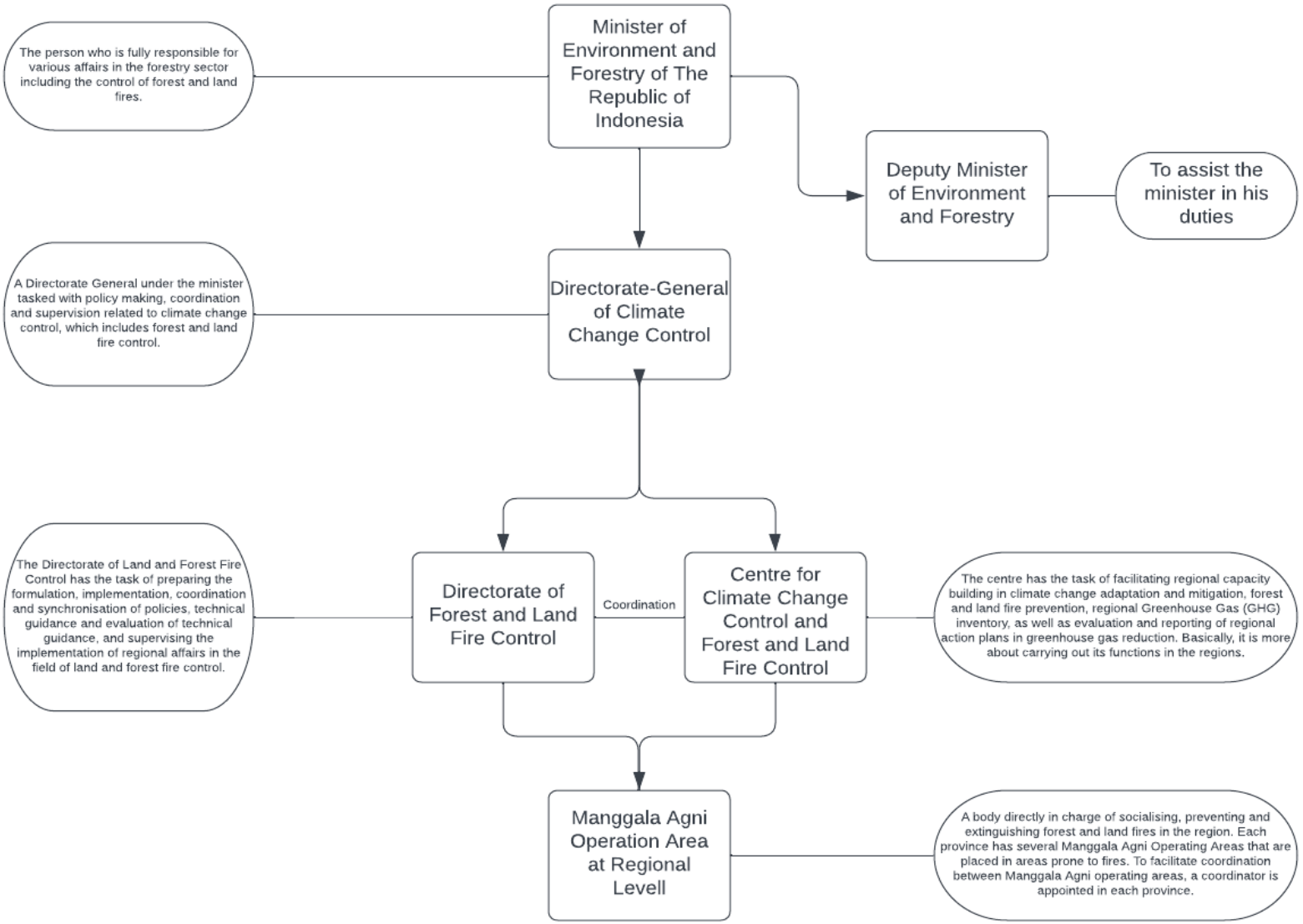

Figure 6. Forest and land fire control structure in the Ministry of Environment and Forestry

Figure 6 above shows the forest and land fire control structure in the Ministry of Environment and Forestry. The Ministry of Environment and Forestry (MoEF) has a complex organizational structure consisting of various levels specifically assigned to deal with the issue of forest and land fires. This structure starts with the Minister and Deputy Minister of Environment and Forestry at the top of the hierarchy. Underneath this is the Directorate General of Climate Change Control (DGCI), which focuses on environmental issues, including forest and land fires. Next, under DGCI, is the Directorate of Forest and Land Fire Control (PKHL), whose main task is coordinating and overseeing forest and land fire control efforts across Indonesia.

In addition, the Directorate of PKHL also works closely with the Center for Climate Change Control and Forest and Land Fire Control (Balai PPIKHL) at the regional level. These units are responsible for implementing forest and land fire control policies and programs directed at the local level. Finally, there is Manggala Agni, a special task force formed by the Ministry of Environment and Forestry. This unit is vital in conducting field operations to extinguish fires, conduct patrols, and monitor and report on forest and land fires. Manggala Agni cooperates with various parties, such as the local government, TNI, POLRI, and the community, or even the private sector, to control forest and land fires in Indonesia.

Manggala Agni is present in every area prone to forest and land fires, which allows them to move quickly to the scene to extinguish fires. In addition, Manggala Agni proactively conducts various socialization programs aimed at communities and companies engaged in the forestry and plantation sectors. These programs aim to educate them not to use fire as a land-clearing method, thus preventing potential forest and land fires.

- National Disaster Management Agency

The National Disaster Management Agency (BNPB) is a significant institution that plays a vital role in Indonesia's disaster mitigation and management, including forest

and land fires. Even though it does not have a department dedicated to fighting forest and land fires in forests, like the Ministry of Environment and Forestry, the BNPB has a significant role in coordinating with various stakeholders in the event of a national forest fire. In addition, as a central agency, BNPB established in each province and city regency coordinating bodies known as Regional Disaster Management Agencies (BPBDs), which function as an extension of BNPB at the local level. To effectively mitigate and manage forest fires in Indonesia, it is crucial to foster cooperation between BNPB and BPBDs. As the National Disaster Management Agency, the BNPB is a critical institution in coordinating collaborative efforts among the various parties involved in forest and land fire control. This responsibility is consistent with Presidential Instruction No. 3/2020, which concentrates on forest and land fire prevention. The significance of the BNPB's contribution to effectively suppressing forest and land fires across Indonesia is highlighted by their crucial role in supervising and administering these collaborative efforts.

- Indonesian National Army (TNI)

The Indonesian National Army (TNI) performs a significant role in combating forest and land fires in Indonesia. They are responsible for suppressing forest and land fires by mobilizing personnel, equipment, and resources in coordination with other relevant agencies. Additionally, the TNI supports the construction and maintenance of infrastructure, such as firebreaks and access roadways, to assist in the containment and extinguishment of forest and land fires. They employ aerial surveillance capabilities to monitor and detect hotspots, contributing to early detection and prompt response. In addition, TNI conducts training programs to enhance personnel and stakeholder firefighting capabilities. TNI protects communities, conserves natural resources, and reduces the adverse effects of forest fires by collaborating with multiple agencies and enforcing laws about fire prevention. According to Presidential Instruction No. 3 of 2020, the TNI is tasked with assisting the National

Disaster Management Agency (BNPB) as the coordinator in mobilizing its forces to combat forest and land fires. This is crucial because the TNI has substantial resources to combat forest fires. Additionally, the TNI comprises three primary branches: the Army, Air Force, and Navy. Due to their respective capabilities, the TNI plays an integral role in regulating forest and land fires in Indonesia.

- Indonesian National Police (POLRI)

The Police and the Indonesian National Army (TNI) must collaborate to control forest and land fires in Indonesia. The Indonesian National Police (POLRI) actively contributes to these efforts by swiftly deploying its trained personnel to fire-affected areas. POLRI's presence is essential for coordinating and implementing nationwide measures to control forest and ground fires. Their vast human resources enable them to respond effectively to fires regardless of severity.

In addition, law enforcement's function within POLRI is crucial in fighting forest and ground fires. As a law enforcement agency, POLRI can act appropriately against those responsible for forest and land fires. These criminals can be identified, apprehended, and processed by applicable laws and regulations. In addition to serving as a deterrent, law enforcement ensures that those responsible for forest and land fires are held accountable for their actions. This strategy sends a clear message that such conduct will not be tolerated, and the repercussions will be severe. POLRI contributes to preventing and mitigating fires by actively participating in law enforcement efforts. Their participation in strategy promotes a more comprehensive and coordinated approach to combating these destructive incidents. In addition, collaborating with POLRI and TNI improves overall suppression and control efforts. By combining their resources, expertise, and labor, these two institutions improve their capacity to combat fires, particularly in situations where the size and intensity of the fires necessitate a coordinated response from several parties.

The collaborative efforts of POLRI and TNI illustrate the significance of interagency cooperation in addressing the complex problem of forest and land fires. These two agencies demonstrate their dedication to safeguarding Indonesia's natural landscapes and mitigating the adverse effects of forest and land fires through their proactive engagement, law enforcement measures, and use of available resources.

- Peatland and Mangrove Restoration Agency

The Peat and Mangrove Restoration Agency (BRGM) needs more direct control over forest and land fires on the ground. However, BRGM plays an essential role in preventing future disasters. Their primary duty is to restore degraded peatlands, which significantly cause forest and land fires. Peatland fires are especially hazardous because they emit large quantities of carbon dioxide into the atmosphere, exacerbating climate change, and are a significant source of haze disasters. Consequently, the performance of BRGM is crucial to the collaborative endeavor to control forest and land fires in Indonesia.

By restoring degraded peatlands, BRGM addresses the underlying causes of fires and helps reduce their frequency. This strategic approach reduces the likelihood of future forest and land fires and contributes to preserving and restoring vital ecosystems. Peatland restoration by BRGM assists in rewetting afflicted areas, increasing water storage capacity, and reducing the likelihood of forest and land fires. This proactive approach is consistent with sustainable land management practices that foster ecological equilibrium and resilience.

Additionally, BRGM's efforts benefit Indonesia's overall environmental objectives, such as reducing greenhouse gas emissions and preserving biodiversity. By rehabilitating peatlands, BRGM contributes to the nation's international obligations, such as the Paris Agreement. Collaboration between BRGM and other stakeholders, such as local communities, research institutions, and relevant government agencies, promotes an all-encompassing approach to forest and land fire prevention. This

multidisciplinary approach assures that diverse fields of expertise are effectively utilized to address the complex challenges of peatland fires. BRGM may have little authority over fire control operations, but its vital role in peatland restoration is essential for preventing forest and land fires. By addressing root causes and rehabilitating damaged peatlands, BRGM contributes significantly to Indonesia's collaborative efforts to control these damaging incidents, safeguard the environment, and promote sustainable land management practices.

- National Research and Innovation Agency (BRIN)

BRIN, the newly formed agency resulting from the merger of LAPAN and BPPT (as well as LIPI and BATAN), performs a critical role in forest fire control in Indonesia. The combined entity brings together expertise and resources to enhance the effectiveness of forest fire suppression efforts across Indonesia. One of BRIN's significant contributions is providing high-quality and comprehensive satellite imagery data, critical for monitoring and suppressing forest and land fires. These data-driven insights empower authorities and firefighting teams to make informed decisions and deploy resources effectively.

In addition, BRIN is actively involved in weather modification operations, another essential aspect of fire control. Using innovative techniques, such as cloud seeding, BRIN seeks to influence weather patterns and reduce the occurrence of conditions that favor the spread of fire. This proactive approach enhances the overall fire suppression strategy and helps reduce the risk of large-scale fires. In addition to weather modification, BRIN also focuses on developing land clearance technologies that do not rely on burning. These sustainable alternatives promote responsible land management practices and minimize the fire risks associated with traditional land clearance methods. By promoting these technologies, BRIN prevents forest and land fires while maintaining ecosystem integrity. The availability of reliable satellite data and the application of weather modification and no-burn land clearance technologies strengthen collaborative efforts to control forest fires in Indonesia. These innovative

approaches provide a comprehensive framework for fire suppression, combining proactive measures with advanced technology.

Moreover, BRIN's function is not only limited to fire control but also encourages continuous research and development in fire prevention and mitigation strategies. Through partnerships with research institutions and stakeholders, BRIN encourages knowledge exchange, innovation, and adoption of best practices in fire management. In conclusion, BRIN strengthens forest fire control in Indonesia by providing satellite imagery data, weather modality, and forest and land fire information.

- Meteorology Climatology and Geophysics Agency (BMKG)

The Meteorology, Climatology, and Geophysics Agency (BMKG) takes the initiative to deliver vital data support and information about smoke distribution, hotspots, weather forecasts, and seasonal patterns and cycles. The Minister of Environment and Forestry and the National Disaster Management Agency Director are just two essential parties with access to this helpful information. BMKG allows informed decision-making and quick response to fire incidents by providing precise and up-to-date data on the distribution of smoke and hotspots. With this information, authorities can better determine the scope of the issue, pinpoint places that pose a risk, and allocate resources for fighting fires and mitigating their effects.

In addition to smoke and fire data, BMKG offers dependable weather forecasts with crucial details on meteorological variables that may impact fire behavior. This makes it possible to be proactive in planning and preparation, which helps avoid and control forest and land fires. BMKG's proficiency in studying seasonal trends and cycles supports long-term fire management plans. By knowing climate patterns, stakeholders can put measures in place to reduce the danger of fire during increased vulnerability.

The dissemination of thorough data and information by BMKG improves coordination amongst many entities involved in fire management. As a result, coordination is made more accessible; everyone involved has a better knowledge of the issue, and effective communication is made possible. To support evidence-based decision-making in forest and land fire management, BMKG actively engages with key government agencies, such as the Minister of Environment and Forestry and the Head of the National Disaster Management Agency. This shows BMKG's commitment to this goal.

- Ministry of Agriculture

The Ministry of Agriculture actively encourages no-burn agricultural land clearing and cultivating practices by providing technical and mechanical support. This assistance helps farmers and agricultural enterprises to use sustainable practices without burning. The government must also ensure that agricultural companies carry out their commitments to implement the structures, infrastructure, and procedures that aid in containing forest and land fires. The ministry ensures adherence to these regulations by overseeing, monitoring, and enhancing fire prevention strategies.

Accordingly, the Ministry of Agriculture is speeding efforts to levy administrative penalties and enforce criminal legislation against companies engaged in land clearing and cultivation methods by burning. With this strategy, those who increase the risk of forest and land fires are held accountable, and a culture of accountability and prevention is promoted. As responsible land management techniques greatly lower the danger of fire events, the ministry's actions also contribute to the broader forest and land fire control plan. The ministry supports environmental conservation and sustainable agriculture objectives by encouraging no-burn methods. Farmers and agricultural enterprises are empowered to embrace alternative practices that are safer, more ecologically friendly, and commercially successful thanks to the technical and mechanical help offered by the Ministry of Agriculture. Information sharing, training initiatives, and access to equipment that is appropriate are all parts of this help. The

ministry employs a comprehensive strategy and collaborates closely with relevant parties, including farmers, agricultural associations, and local governments, to ensure the effective adoption of no-burn measures. Through their combined efforts, the agricultural industry can better prevent fires and promote a culture of responsible land management.

- NGOs

In Indonesia, NGOs are crucial in controlling forest and land fires. They act as tenacious environmental activists, influencing legislation and educating the public about the significance of fire prevention. NGOs promote policy reforms that support successful attempts to suppress forest and land fires through campaigns, advocacy, and public outreach. NGOs are also involved in studying and observing forest and land fires. They gather information, perform analysis, and generate reports that aid in understanding the origins and effects of fires. More effective fire control plans and measures are based on this data.

NGOs aid in community capacity-building for managing fires by offering training. They offer information, abilities, and best practices for avoiding fires and implementing eco-friendly farming methods. Cooperation with the government, academic institutions, and the corporate sector is essential to managing forest and land fires. NGOs collaborate with various partners to exchange information, assets, and experiences. These collaborations improve coordination and result in all-encompassing fire problem solutions.

Additionally, NGOs are crucial in overseeing government and corporate efforts connected to fire management. They oversee policy, implementation, and law enforcement to ensure efficient and responsible activity in preventing and managing forest and land fires. NGOs also promote community empowerment in fire prevention initiatives. Local communities are involved in tree planting, fire monitoring, and

forest patrols. Communities are involved, which raises awareness, promotes shared responsibility, and fosters sustainability in fire management.

Two reputable non-governmental organizations (NGOs) involved in managing forest and land fires are the World Wildlife Fund for Nature (WWF Indonesia) and Yayasan Konservasi Alam Nusantara (YKAN). To educate the public about the value of fire prevention, WWF Indonesia runs campaigns and advocates for regulatory changes. They also monitor fires, gather information, and examine their causes and effects. In the meantime, YKAN collaborates with local authorities and communities on sustainable farming methods and fire prevention initiatives. Wahana Lingkungan Hidup Indonesia (WALHI) is a well-known environmental non-governmental organization that works to prevent land burning. WALHI encourages the government to enhance monitoring and law enforcement by conducting campaigns and monitoring businesses connected to forest and land fires. In Indonesia, they prioritize sustainability and environmental protection. The fight against forest and land fires has benefited from the work of WWF Indonesia, YKAN, and WALHI through their numerous initiatives and projects. They work to increase public awareness, involve local communities, and promote sustainable practices to reduce forest and land fire danger through campaigns, policy lobbying, monitoring, and collaboration with other stakeholders. These contributions are crucial to Indonesia's attempts to conserve its forests, lands, and environment. NGOs are vital and varied in Indonesia's efforts to manage forest and land fires. They work diligently to enhance the execution of fire control programs and protect the environment through advocacy, research, training, collaboration, monitoring, and community empowerment.

- Companies in Forestry and Plantation

The Indonesian government has engaged the private sector to combat forest fires. To this end, the government has issued several regulations mandating that companies engaged in the forestry and plantation industries, particularly oil palm plantations, take steps to control forest and land fires, particularly in areas they manage. This is

necessary for these businesses to be accountable for environmental sustainability. In addition, the government has prohibited the practice of land cleansing through burning. This practice is highly detrimental to the environment and contributes to forest fires. This prohibition is intended to reduce the risk of forest fires and protect Indonesia's natural ecosystems.

Companies engaged in forestry and plantation operations must implement effective fire prevention and suppression measures. They must acquire adequate firefighting equipment and train their personnel in forest fire management. This is essential to ensure their ability to combat and control fires in their regions. In Indonesia, large conglomerates such as Sinar Mas Group, APRIL Group, and Wilmar Group own forestry and oil palm plantation companies. They are also actively involved in Indonesian initiatives to combat forest and land fires. Forest fire prevention efforts include zero-burning policies, investments in firefighting infrastructure, and collaboration with relevant parties.

Appendix 4

Detailed explanation of the duties and functions of the actors involved in controlling forest and land fires at Riau Province level

- Riau Province Forest and Land Fire Control Task Force (Forest and land fires Taskforces)

Riau Province's Forest and Land Fire Task Force (Forest and Land Fires Taskforce) is crucial in the region's forest and land fire control and management. Their responsibilities include multiple facets of fire suppression and prevention. Surveillance and early detection are among their primary responsibilities. The Forest and Land Fires Task Force monitors the weather, relative humidity, and conflagration risk. This surveillance allows them to quickly identify hotspots and provide authorities with accurate data. Moreover, the Forest and Land Fires Task Force regulates and coordinates operational activities. They collaborate with parties such as the Regional Disaster Management Agency (BPBD), the Indonesian National Army (TNI), and the Indonesian National Police (POLRI) to ensure practical firefighting efforts. This requires mobilizing personnel, equipment, and resources to extinguish fires effectively. In addition, the Forest and Land Fires Task Force directly participates in firefighting operations. Personnel and resources are deployed to affected areas, directing forest and land fire suppression efforts. Their expertise and coordination contribute to the effective containment and extinguishment of fires.

The Forest and Land Fires Task Force also plays a significant role in community education and awareness. They disseminate information about safe land management practices, fire prevention measures, and proper response procedures. By promoting awareness and preparedness, they hope to lessen the risks and consequences of forest and land fires.

The Forest and Land Fires Task Force collaborates with law enforcement agencies such as the TNI and POLRI to enforce forest fire regulations. They support efforts to

investigate and prosecute those responsible for illegal burning for accountability and deterrence. The Forest and Land Fires Task Force of Riau Province contributes significantly to controlling and averting forest and land fires through its comprehensive approach and responsibilities. Their actions protect the environment and Riau's local communities' welfare and safety.

- Riau Province Environment and Forestry Service.

The Environment and Forestry Service is one of the critical elements in preventing forest and land fires in the province of Riau. As the primary organ, its position is crucial. In Riau Province, the Riau Provincial Environment and Forestry Service (DLHK Riau) has complete authority in environmental and forestry, including forest and land fire control. Even though it is a provincial government agency, DLHK Riau is an extension of the Ministry of the Environment in the region.

The Riau Provincial Environment and Forestry Agency (DLHK) is vital in regulating forest and land fires in Riau. Utilizing satellites and remote sensing systems to detect hotspots or fires, DLHK Riau Province is accountable for fire monitoring and detection. Involving multiple parties, such as the Regional Disaster Management Agency (BPBD), the TNI, and the POLRI, DLHK Riau Province, is essential in coordination and emergency management. This responsibility entails coordinating emergency responses and mobilizing the required personnel and resources. In addition, DLHK Riau Province has the authority to formulate forest and land fire control policies and regulations. They are responsible for crafting regulations governing land use, fire prevention, and penalties for forest and land burning violations. To maintain order and compliance with these rules, DLHK Riau Province is also responsible for law enforcement. They collaborate closely with law enforcement officials, such as police and prosecutors, to investigate illicit burning cases and prosecute offenders per applicable laws.

Additionally, DLHK Riau Province conducts educational activities and campaigns to increase public awareness of the perils of forest and land burning and the significance of sustainable management. These initiatives seek to involve the community in fire prevention and responsible forest management. It is essential to observe that the roles, responsibilities, and authorities of DLHK Riau Province in forest and land fire control are subject to change based on policy developments and the current situation. For an accurate understanding of forest and land fire control efforts in Riau, the most recent information published by DLHK Riau Province or other relevant agencies should always be consulted.

- Riau Province Regional Disaster Management Agency

The Riau Province Regional Disaster Management Agency (BPBD) is crucial in forest and land fire control. As an institution primarily responsible for disaster management, BPBD Riau Province has extensive authority over planning, coordination, monitoring, evacuation, and post-fire recovery, among other things. In forest and land fire control planning, the Riau Provincial Environment and Forestry Agency (DLHK), TNI, POLRI, and local administrations are involved with BPBD Riau Province. They establish fire control posts, divide tasks and responsibilities, and mobilize the required personnel and resources. In addition, BPBDs use advanced technology, such as satellites and remote sensing systems, to monitor and detect forest and land fires effectively.

The BPBDs of Riau Province have crucial roles in evacuating and rescuing communities imperiled by fire. They collaborate closely with law enforcement, the military, and volunteers to plan and evacuate affected populations. They also administer first aid and assure the safety of fire victims. BPBD Riau Province focuses primarily on education and socialization to increase public awareness of the hazards of forest and land fires. They organize educational activities, seminars, training, and community outreach to promote knowledge of fire prevention and suppression procedures. In addition, BPBD Riau Province collaborates with various stakeholders,

such as government agencies, the private sector, research institutions, and communities, to enhance the efficacy of forest and land fire control efforts and reduce their negative impacts.

In performing its duties, BPBD Riau Province complies with forest and land fire control regulations and policies established by the central government and local administrations. They have a team trained and competent in forest and land fire management and the equipment and technology required for the task.

- Manggala Agni Riau Province

Through the Sumatra Regional Center for Climate Change and Forest and Land Fire Control (see Figure 11), the Ministry of Environment and Forestry has a task force tasked with averting and extinguishing forest and land fires at fire locations. There are four operational areas (Daops) in Riau Province alone: Daops Pekanbaru, Daops Siak, Daops Dumai, and Daops Rengat. These four Daops are in the vanguard of efforts to prevent and extinguish forest and land fires in various regions of the province of Riau. They function as operational bases and coordination centers for forest and land fire prevention and suppression tasks. They work intensively with communities using an approach founded on scientific understanding and best practices in forests and land fires.

The primary responsibility of the task force is to educate communities on safe land management practices and fire prevention methods to prevent fires. In addition, they participate in direct fire suppression operations at the scene. They collaborate with other firefighting teams, including the Forest and Land Fires Task Force, BPBD, TNI, and POLRI, to extinguish and control flames efficiently. In addition, they offer guidance to the Fire Awareness Communities (Masyarakat Peduli Api, MPA) that have been established in various communities throughout the province of Riau. Providing comprehensive and structured training to the communities to prevent and extinguish forest and land fires in their villages is the most apparent form of

coaching. In addition to its operational responsibilities, the task force plays a crucial role in educating the public about the hazards of forest and land fires. They disseminate information regarding fire prevention measures, such as land and fire management. Increasing public awareness is anticipated to reduce the risk and impact of forest and land fires in Riau Province.

- TNI AD - Wirabima Resort Military Command (Korem 031/ Wirabima)

As one of the Bukit Barisan Military Region Command structures, the Wirabima Resort Military Command is essential in controlling and extinguishing forest and land fires. Korem Wirabima is a regional command responsible for maintaining security and order in its territory. It is located in the province of Riau. Specifically, in forest and land fires, Korem Wirabima collaborates with numerous agencies to effectively carry out forest and land fire prevention and suppression duties.

In the province of Riau, each regency and city is administered by a Military Regency Command (Kodim). Kodim contributes significantly to forest and land fire suppression and prevention efforts. They coordinate efforts at the local level with relevant agencies, such as the Sumatra Regional Land and Forest Fire Control Center and Korem Wirabima. The Bintara Pembina Desa is an essential component of the Korem Wirabima architecture. Bintara Pembina Desa is a military personnel stationed at the village level to guide and assist communities on various issues, including forest and land fire prevention and suppression. They are knowledgeable and skilled in educating communities about safe land management practices and forest and land fire prevention. In Riau Province, the prevalence of diverse structures such as Korem Wirabima and Kodim in each regency and city is highly beneficial for preventing and suppressing forest and land fires.

- Roesmin Noerjadin Air Base, Air Force

Roesmin Noerjadin Air Base (Lanud Roesmin Noerjadin) is a branch of the Indonesian Air Force responsible for and has authority over various air operations. Roesmin Noerjadin Air Base, located in Pekanbaru, Riau, has a strategic position in regulating forest and land fires. Utilizing its air operations capabilities, Roesmin Noerjadin Airbase plays a crucial role in efforts to prevent and eradicate forest and land fires in the region. In addition to being an airstrip, Roesmin Noerjadin Airstrip is a home base for all helicopters prepared by various agencies to assist with forest and land fire-related air operations. These helicopters enable a swift and effective response to forest and land fires in the region.

Lanud Roesmin Noerjadin also significantly develops Weather Modification Techniques (TMC) to reduce artificial rainfall during prolonged droughts. TMC is one of the measures that can be taken to combat drought and decrease the likelihood of forest and land fires. Then Lanud Roesmin Noerjadin is also the coordinator for rapidly extinguishing forest and land fires using Water Bombing. As an air coordinator, Lanud Roesmin Noerjadin coordinates actively with various relevant parties. This coordination is conducted to control forest and land fires by determining the strategy for aviation operations, distributing resources, and implementing practical tasks. It is crucial to work with various related parties to prevent forest and land fires from being carried out synergistically and efficiently. As a member of the Indonesian Air Force, Lanud Roesmin Noerjadin is crucial in regulating forest and land fires in Riau Province. Its air operations, helicopter home base, TMC capability, and coordination with relevant stakeholders contribute to the region's effective forest and land fire prevention, suppression, and control.

- Indonesian National Police - Riau Regional Police

As the branch of the Indonesian National Police in Riau Province, the Riau Regional Police plays a crucial role in preventing forest and land fires. As a law enforcement agency, Polda Riau is responsible for maintaining regional security and order. They work diligently to prevent and extinguish forest and land fires to safeguard the

environment and people's lives. Riau Police's organizational structure includes a network extending to the village level. There are Resort Police at the regency/city level, Neighborhood Police at the sub-regency level, and Bhabinkamtibmas (Bintara Pembina Keamanan dan Ketertiban Masyarakat) at the village level. Bhabinkamtibmas collaborates with Babinsa of the Indonesian Army to conduct patrols, provide education, and take preventative action to prevent and control forest and land fires.

Additionally, the Riau Police Department utilizes modern technology to monitor forest and land fires. The dashboard Lancang Kuning is one of their innovations. Through this dashboard, Riau Police can accurately monitor the development of hotspots, smoke concentration, and meteorological conditions that may influence the spread of fires. This enables them to take swift and precise actions to combat forest and land fires effectively. In addition to their operational duties, Riau Police are also responsible for forest and land fire law enforcement. They implement applicable legal instruments to investigate and prosecute intentional forest fires. By conducting thorough investigations and submitting lawsuits against those responsible for forest and land fire crimes, the Riau Police Department seeks to provide a deterrent effect and protect the community and the environment.

Overall, the Riau Police play a crucial role in preventing and extinguishing forest and land fires in the province of Riau. By having village-level structures, collaborating closely with the Indonesian Army, employing the Lancang Kuning dashboard technology, and enforcing the law, Riau Police has a comprehensive capability to combat forest and land fires. Riau Police seeks to protect the environment and the lives and well-being of the people of Riau from the threat of forest and land fires through collaboration with related agencies and active community involvement.

- Forest Management Units in Riau Province.

Forest Management Units (FMUs) are an integral component of the Environment and Forestry Service, operating at the site level according to specified forestry areas. FMUs play a crucial function in controlling forest and land fires. FMUs have the expertise and in-depth knowledge of the forest areas they manage and are accountable for sustaining the environment. FMUs are essential in implementing effective fire prevention and suppression measures in forest and land fires.

In the province of Riau, thirteen FMUs are dispersed throughout numerous regions. These FMUs consist of KPHs. The thirteen FMUs are the Minas Tahura Model Forest Management Unit (FMU), the Tasik Besar Serkap Model Forest Management Unit (FMU), the Bagansiapiapi Forest Management Unit (FMU), the Bengkalis Island Forest Management Unit (FMU), the Mandau Forest Management Unit (FMU), the Rokan Forest Management Unit (FMU), the Suligi Batu Gajah Forest Management Unit, the Kampar Kiri Forest Management Unit, the Sorek Forest Management Each FMU is entrusted with specific responsibilities for managing and suppressing forest and land fires in the forest areas under their jurisdiction. With FMUs dispersed throughout the province of Riau, effective and coordinated supervision and countermeasures against forest and land fires can be implemented.

As the lowest level of the Riau Environment and Forestry Agency, FMUs comprehensively comprehend the forest areas in their region. They collect extensive data on the forest's condition, including vegetation varieties, topography, and weather patterns influencing the fire risk. This knowledge allows FMUs to identify potential locations and take precautions to prevent forest and land fires. The FMU employs essential personnel, such as forest rangers and fire brigades, to carry out its responsibilities. Forest rangers patrolled and monitored illicit activities that may spark forest fires. In the meantime, fire brigades in some FMUs prone to forest fires have a unique responsibility to extinguish and suppress forest fires swiftly and effectively. The presence of these individuals strengthens Riau's efforts to extinguish forest and land fires.

FMUs also perform coordination duties with multiple relevant parties. They collaborate with government agencies, communities, businesses, and non-government organizations to prevent and control forest and land fires. To ensure that forest and land fire control efforts are integrated and effective, FMUs and relevant stakeholders must work together well. FMUs serve as the frontline in regulating forest and land fires. They implement post-fire prevention, suppression, and recovery measures in the forest areas they manage. FMUs play a significant role in preserving forests and reducing the risk of forest and land fires in the province of Riau, Indonesia, due to their extensive knowledge of forest area conditions and their cooperation with various related parties.

- Riau Province Agency for Meteorology, Climatology, and Geophysics.

The Riau Province Meteorology, Climatology, and Geophysics Agency (BMKG Riau) is one of the province's central (vertical) agencies. The function of BMKG in controlling forest and land fires in the province of Riau is crucial. They are responsible for perpetually monitoring weather conditions, issuing early warnings, and forecasting fire risk. Using weather monitoring tools, satellite data, and other modern equipment, BMKG can rapidly detect an increase in fire danger and communicate this information to other relevant parties, such as the existing forest and land fire task force. Additionally, BMKG plays a role in anticipating the spread of smoke from forest and land fires. BMKG can estimate wind direction and speed, precipitation amounts, and other atmospheric conditions using their climate models and monitoring instruments. This information is indispensable for strategic fire suppression, evacuation, and public health protection decisions.

- Network for Riau Forest Rescue (Jikalahari)

Jikalahari (Riau Forest Rescue Working Network) is crucial in controlling forest and land fires in the province of Riau. This non-governmental organization performs a role in monitoring potential fire-causing activities. They monitor forestry and

plantation companies in the region and report violations involving illegal burning or practices that could spark fires to the appropriate authorities. In addition to monitoring, Jikalahari conducts advocacy and public awareness campaigns. They inform the public through these campaigns about the dangers of forest and land fires, the significance of maintaining forest ecosystems, and the preservation of peatlands. Therefore, Jikalahari attempts to influence people's behavior and encourage active fire control participation.

In addition to collaborating with local governments, environmental institutions, and other organizations, Jikalahari also works with several other related stakeholders. This collaboration is done through forest and land fire control discussion forums and meetings. The objective is to maximize fire suppression efforts by leveraging existing resources and fostering synergies between various stakeholders. In addition, Jikalahari conducts independent forest and land fire monitoring in the province of Riau. They compile data and information regarding the fires, including the burned area of land, the location of hotspots, and the impact on the environment and society. This information is then shared through social media, annual reports, and other channels. Jikalahari hopes that by disseminating this information, the public will better understand the fire situation and the significance of effective control.

While Jikalahari does not have the legal or police authority to enforce violations, they can report their findings to the authorities and urge them to take action against practices that affect the environment and may cause fires. Through independent supervision, advocacy, collaboration, and monitoring, Jikalahari plays a significant role in efforts to control forest and land fires in the province of Riau.

- Wahana Lingkungan Hidup Riau (WALHI Riau)

Walhi Riau (Wahana Lingkungan Hidup Indonesia Riau) is an environmentally focused non-governmental organization that is important in controlling forest and land fires in Riau Province. As a non-governmental organization, Walhi Riau actively

monitors activities that can trigger fires. It intensively supervises forestry, plantation, and other industrial companies operating in the region. In addition to monitoring, Walhi Riau also engages in advocacy and campaigns to raise public awareness of the dangers of forest and land fires. They conduct intensive communication to convey important information about maintaining forest ecosystems, protecting peatlands, and fire prevention efforts. In addition, Walhi Riau also advocates for sustainable policy and system changes, including asking the government to implement effective fire prevention policies and punishing those who illegally burn forests and land.

In addition, Walhi Riau also collaborates with various related parties, such as local governments, environmental organizations, academics, and communities. Walhi Riau actively shares knowledge, experience, and resources to develop comprehensive fire control solutions through discussion forums, meetings, and other collaborative activities. This collaboration aims to maximize the utilization of existing resources and create synergies among various parties. In addition, Walhi Riau conducts independent monitoring of forest and land fires in Riau. They collect accurate data and information on the area of land burned, the location of hotspots, and the impact of fires on the environment and communities. This information supports advocacy, campaigns, and reporting on the fires and provides clear information to the broader community.

- April Group / RAPP Firefighter

RAPP (Riau Andalan Pulp & Paper) is one of Riau's pulp and paper companies. It employs a team of firefighters known as RAPP FireFighters, who are essential in preventing forest and land fires in the region. One of the primary responsibilities of RAPP FireFighters is to extinguish forest and land fires that break out in the company's vicinity. They have both trained personnel and the necessary apparatus to combat fires. The team conducts routine patrols to identify potential fires or hotspots in the company's neighborhoods. They respond immediately to fires and attempt to extinguish them to prevent their spread.

RAPP FireFighters are also responsible for fire prevention in addition to suppression. They remove the surrounding land and vegetation to reduce the risk of fire. In addition, they educate employees and neighboring communities on the significance of fire prevention and what to do in the event of a fire. RAPP Firefighters are prohibited from working outside company property and its immediate vicinity. In the event of larger fires or fires that extend beyond their company's territory, they collaborate with the authorities.

- Group Sinar Mas Firefighter

The Sinarmas Group, which includes its pulp and paper subsidiaries, has forest firefighting squads in Riau that assist in controlling forest and land fires. Sinarmas' forest firefighting crews are essential for putting out and preventing forest fires on company property. The Sinarmas Forest Fire Fighting team's primary responsibility is to respond to and extinguish fires within the corporation and its environs. They possess trained personnel and the necessary firefighting apparatus, including fire extinguishers, personal protective equipment, and specialized firefighting vehicles. To minimize damage and prevent the spread of fires to other areas, these teams endeavor to respond quickly to fires.

In addition to putting out forest fires, the Forest Fire Fighting team of Sinarmas is also involved in fire prevention. They maintain and administer the company's land and environment to reduce the fire risk. This involves the strategic placement of firefighting points, the clearing of vegetation, and routine monitoring. Additionally, the team works to educate employees and adjacent communities on how to prevent fires and what to do in case of a fire.

- Masyarakat Peduli Api (MPA)/ Fir Awareness Communities

Masyarakat Peduli Api serves as the eyes and hearing on the ground, assisting in detecting, reporting, and reducing the risk of forest and land fires in Riau Province.

One of the primary responsibilities of Masyarakat Peduli Api is to conduct active neighborhood surveillance. They report immediately any evidence of fire, such as smoke or unusual flames, to authorities such as the Regional Disaster Management Agency (BPBD), the Forestry Service, or other relevant agencies. Fire Concerned Communities contribute to the acceleration of fire response and suppression, making it possible to prevent fires from extending to other areas.

Additionally, Fire Awareness Communities participate in fire prevention initiatives. They engage in socialization and education campaigns to inform the public of the hazards of forest and land fires and how to prevent them. In addition, they provide communities with information and training on how to prevent things that can spark fires, such as uncontrolled land burning and the use of fire to defend land. Fire Awareness Communities actively monitor, report, and prevent forest and land fires. Although they lack the legal authority to combat forest and land fires directly, they can contribute significantly to their suppression by collaborating with authorities.

Appendix 5

Detailed explanation of the organizational structure of the Forest and Land Fire Control Task Force in Riau Province

In the structure, there is also a steering element consisting of various leaders of government institutions at the Riau Province level, such as the Chairman of the Provincial DPRD (Regional House of Representatives), Head of the High Prosecutor's Office, Chairman of the High Court, Head of the Regional Intelligence Agency, Commander of the Dumai Naval Base, Chairman of the Riau Malay Customary Institution, Rector of Universities, etc., even academics such as experts in the field of environment and forestry are also involved. The steering committee has the task of providing strategic inputs to the task force following their fields.

The Riau Province Forest and Land Fire Control Task Force is supported by a secretariat that plays an important role. The secretariat consists of three sections, each with its focus and responsibilities. First, the administration and finance section handles the administrative and financial aspects of the Task Force's activities. They ensure the administrative process and financial management are done well and transparently. Then, the public relations and publication section informs the general about forest and land fire control activities. They manage communication with the public, liaise with the mass media, and publish relevant information so that the public can understand the importance of forest and land fire control and the efforts made by the Task Force. The data and report section is crucial in collecting, analyzing, and reporting forest and ground fire control data. They collect data on hotspots, areas burned, and other relevant factors. With accurate and up-to-date data, the Task Force can make informed decisions and plan effective control measures.

The head of the secretariat, held by the Secretary of BPBD Riau Province, is primarily responsible for leading and coordinating all sections within the secretariat. They maintain the smooth operation of the administration, ensure good cooperation between secretariat members, and act as a liaison between the Task Force and various related parties. Within the secretariat are members from various backgrounds, including the Regional Asset and Financial Management Agency, Communication and Information Agency, Riau Regional Police, Military Resort Command 031/Wirabima, Environment and Forestry Agency, journalists, National Land Agency, and many more. The presence of members from these various agencies and professions aims to ensure a rapid response and functional coordination from the multiple stakeholders involved in controlling forest and land fires in Riau Province. In addition to these tasks, the secretariat plays a vital role in activating the primary forest and land fire management posts. These posts serve as coordination and reporting centers for activities in the field, allowing the Task Force to monitor and take necessary actions quickly and efficiently.

In its operations, the Riau Province Forest and Land Fire Task Force (Forest and land fires) is divided into seven fields with their responsibilities and functions. The first is the Prevention and Mitigation Division, led by the Head of Division, the Chief of Operational Affairs of the Riau Regional Police (Karo Ops Polda Riau), with the Deputy Head of Division held by the Chief of Territorial Staff of Korem 031/Wira Bima (Head of Territorial Section). This division involves members such as the Director of Binmas Polda Riau, Peat Restoration Agency (BRG), Roesmin Noerjadin Air Force Base (Lanud RSN) (Head of Intelligence), Community and Village Empowerment Office and Riau Provincial Population and Civil Registration Office (Dinas PMD dan Dukcapil Prov. Riau), Riau Provincial Investment and One-Stop Integrated Service Office (DPMPTSP Prov. Riau), Riau Provincial Plantation Office, Ministry of Environment and Forestry (KLHK), Riau Provincial Environment and Forestry Office (Dinas LHK Prov. Riau), Head of Preparedness Subdivision of Riau Provincial Disaster Management Agency

(BPBD Prov. Riau), Malay Customary Institution (LAM) Riau, Police Communication Center (SENKOM Polri) Riau, Riau Provincial Natural Resources Conservation Center (BBKSDA), Riau Provincial Development Planning, Research and Development Agency (Bappedalitbang Prov. Riau), Universities/Academics, Scout Movement, Sumatra III River Basin Agency (BWS) Private sector, Community Organizations (CSOs), and Student Executive. Community Organization, dan Riau Community Communication Center (Senkom) Riau.

The third division is the Air Operations Division, which is responsible for formulating, planning, organizing, and carrying out air-based forest and land fire control operations. This division is led by the Head of the Division, the Head of the Operations Service of the Roesmin Nurjadin Air Force Base (Kadis Ops Lanud Roesmin Nurjadin). Members of the Air Operations Division consist of various agencies, including the Korem 031/Wira Bima Officer of Territorial Intelligence and Security Force, the Riau Police Air and Water Police Directorate (Dir Polairud Polda Riau), the Riau Provincial Disaster Management Agency (BPBD Prov. Riau) (Head of Prevention Subbed), the Meteorology, Climatology and Geophysics Agency (BMKG), the Agency for the Assessment and Application of Technology (BPPT) (Now BRIN), the Ministry of Environment and Forestry (KLHK), and the private sector. The Air Operations Division has the main task of formulating, planning, organizing, and implementing air-based forest and ground fire control operations. This includes water bombing, weather modification, and ground checks/monitoring of hotspots by air. In addition, they are also responsible for coordinating aerial fire suppression operations involving helicopters from the National Disaster Management Agency (BNPB) and the private sector for water bombing. Ground operations are also coordinated to achieve optimal fire suppression results.

The fourth area is the Law Enforcement Division, which is responsible for formulating, planning, organizing, and carrying out law enforcement activities related to alleged crimes committed by individuals or legal entities with the modus operandi of forest and land burning. This task includes investigation and prosecution activities to uncover and take action against perpetrators of crimes related to forest and land burning. The Law Enforcement Division is led by the Head of Division, namely the Director of Special Criminal Investigation of Riau Police (Direskrimsus Polda Riau), with the Deputy Head of Division held by the Chief of Intelligence Staff of Korem 031/Wira Bima (Kasi Intel Korem 031/WB). Members of this field consist of various agencies, including Riau Police, Roesmin Nurjadin Air Force Base (Military Police of Airforce), TNI (Military Police), Riau High Prosecutor's Office (Kejati Riau), Ministry of Environment and Forestry (KLHK) MoEF (Head of Region 3 Law Enforcement, Riau Provincial Environment and Forestry Service (Dinas LHK Prov. Riau), and Riau Provincial Civil Service Police Unit (Satpol PP Prov. Riau). In carrying out its duties, the Law Enforcement Division is responsible for formulating effective law enforcement strategies and carrying out investigations and investigations into alleged criminal acts related to forest and land burning.

The fifth division is the Health Services Division, which is tasked with formulating, planning, organizing, and implementing health service activities for communities affected by forest and land fires. This task includes efforts to provide appropriate health services to individuals or groups in need due to the impact of smoke from forest and land fires. The Health Services Division is led by the Head of the Division, the Head of the Riau Provincial Health Office. Members of this division include military resort command 031/Wirabima (Regional Health Detachment Commander), Riau Police Health Doctor Division, Roesmin Nurjadin Air Force Base (Karumkit), Arifin Ahmad Regional General Hospital Pekanbaru, Riau Provincial Social Service, Port Health Office, Petala Bumi Regional General Hospital, Indonesian Red Cross Riau Province (PMI Prov. Riau), Indonesian Red

Cross, private sector, Disaster Preparedness Cadets, Student Executive Board (BEM)/University Student, Indonesian Medical Association Riau (IDI Riau). Indonesian Emergency and Disaster Nurses Association (HIPGABI)

In carrying out its duties, the Health Services Division is responsible for formulating effective health service strategies and implementing these activities for communities affected by forest and land fires. This includes providing medical care, rehabilitation, and treatment of health impacts caused by smoke. This division also plays a role in coordinating all available resources, both personnel and health facilities, to support health service efforts in emergency conditions due to smoke.

The sixth division is the Logistics and Equipment Division, which is in charge of formulating, planning, organizing, and implementing the preparation of facilities and logistics for forest and land fire control operations. The responsibilities of this division include coordinating all available potential in providing the facilities and logistics needed to carry out forest and land fire suppression activities in the region. The Logistics and Equipment Division is led by the Head of the Division, who is the Head of the General Bureau of the Riau Provincial Secretariat, with the Deputy Head of the Division held by the Logistics Officer of Korem 031/Wira Bima. Members of this field include the Head of Distribution and Logistics of the Riau Provincial Disaster Management Agency (BPBD Prov. Riau), Riau Police (Head of House and Infrastructure Facilities), Roesmin Nurjadin Air Force Base (Head of Logistics Service), Ministry of Environment and Forestry (KLHK) (Secretary of the Riau Manggala Agni Regional Coordinator), Riau Provincial Environment and Forestry Service (Riau Prov. LHK Service), Riau Provincial Plantation Service, Riau Provincial Social Service, and the private sector. In carrying out its duties, the Logistics and Equipment Division is responsible for planning and implementing the preparation of facilities and logistics needed in forest and land fire control operations. This

includes providing firefighting equipment, transportation, human resources, and logistics such as water, fuel, and food. This division also plays a role in coordinating all available potential, both from government agencies and the private sector, to support effective forest and land fire suppression activities.

The seventh division is the Emergency Transition to Recovery Division, which is in charge of formulating, planning, organizing, and implementing recovery activities for areas affected by disasters due to forest and land fires. This division is responsible for restoring conditions and rebuilding affected areas after the emergency phase of fire management. A Division Head, the Head of the Riau Province Environment and Forestry Service, leads the Emergency Transition to Recovery Division. The Deputy Head is the Head of the Rehabilitation and Reconstruction Division of the Riau Province Regional Disaster Management Agency (BPBD Prov. Riau). Members of this division include the Riau Provincial Public Works and Spatial Planning Office (PUPR Prov. Riau), Riau Police (Roops Staff Officer), Korem 031/Wira Bima (Pasibakti Staff Officer), Roesmin Nurjadin Air Force Base (Head of Planning, Monitoring, and Evaluation Bureau), Peat Restoration and Mangrove Agency (BRGM), and Head of Reconstruction of Riau Provincial Disaster Management Agency (BPBD Prov. Riau). The structure of the Forest and Land Fires Task Force in Riau Province is followed by the form of the Forest and Land Fires Task Force at the Regency/City level, known as the Sub Task Force. This structure covers the sub-regency to the village level. At the Regency/City level, the Forest and Land Fires Sub Task Force is led by the Regent or Mayor. This structure is almost the same as the structure of the Task Force at the Provincial level but with one difference: no air operations field.

At the Sub-regency level, four areas are referred to as units: the Prevention Unit, Suppression, Law Enforcement, and Health Services. This structure is led by the Camat (Head of Sub-regency), with Deputy Coordinators held by the Military Rayon Commander and Sector Police Chief. The Prevention Unit is responsible

for preventing forest and land fires in the sub-regency. The Suppression Unit is in charge of fire-fighting activities at the sub-regency level. The Law Enforcement Unit is responsible for conducting investigations, inquiries, and law enforcement related to alleged crimes related to forest and land fires. At the same time, the Health Services Unit is responsible for providing health services to affected communities.

At the lowest level, the Village level, the structure is more straightforward. The Village Head acts as the Sub-Coordinator. There is a Prevention Working Group involving the Police Babinkamtibmas and a Suppression Working Group concerning the Babinsa, as well as involving village community members. This structure is designed to ensure coordination and implementation of forest and land fire management tasks at the level closest to the community.

With an organized structure, forest and land fire suppression is expected to be carried out effectively and efficiently from the provincial to village level. Each level in this structure has its roles and responsibilities so that cooperation and coordination between task forces can be well established to achieve common goals, namely reducing the risk of forest and land fires and protecting the community and the environment.

Appendix 6

Detailed explanation regarding the determination of emergency status for forest and land fires

Determination of each emergency status depends on a decision from the lower level, namely, the regency/city. Forest and land fire Emergency Alert Status at the Regency/City level are determined by:

1. If there is a potential for forest and land fire disasters in an area in the form of hotspots/fires occurring in the area and the number of hotspots tends to increase, it is deemed necessary to take preparedness steps.
2. The increasing escalation of the threat of forest and land fires for the future based on the results of monitoring and analysis by the authorized agency, namely the BMKG, especially the weather conditions ahead, which have the potential to be dry and have the potential for forest and land fires.
3. Based on the situation described above, the Regency/City BPBD holds a Coordination Meeting involving all disaster stakeholders to discuss the developing situation and agree on the proposal to establish an Emergency Alert Status. Then, the BPBD proposes in writing to the Regent/Mayor to show an Emergency Standby Status.
4. The Regent/Mayor establishes Emergency Alert Status for Forest and Land Fire Disasters in a Regent/Mayor Decree and reports this to the Governor through the Provincial BPBD. After the Governor receives a report from the Regent/Mayor, the Governor assigns the Chief Executive of the Provincial BPBD to take the necessary steps and actions by the applicable regulations.

Regarding the emergency standby status at the Riau Province level, the Governor of Riau must determine the status according to the provisions below:

1. There are already several hotspots/fires in regencies/cities, and the number of hotspots tends to increase, so it is deemed necessary to take preparedness measures.
2. Based on the results of weather monitoring and analysis from the Meteorology, Climatology, and Geophysics Agency, the Riau Province has the potential to experience a dry season that can cause forest and land fires. There is an Emergency Standby Status Determination from the Regent/Mayor with 2 (two) regencies/cities or more.
3. Based on the provisions described above, the Riau Provincial BPBD held a Coordination Meeting involving all Disaster stakeholders at the Provincial level to agree to the proposal to establish an Emergency Alert Status with due regard to the suggestions and considerations from the relevant agencies, and then BPBD proposes in writing to the Governor to show an Emergency Standby Status
4. Determination of the Governor's Emergency Standby Status is stated in the Governor's Decree.
5. By establishing an Emergency Alert Status, the Provincial Government, through the Provincial BPBD, will immediately form a Forest and Land Fire Control Unit Task Force Command by involving all disaster stakeholders and activating forest and land fire control command posts.

As the lowest emergency status in controlling forest and land fires in Indonesia, everything is done as appropriately and as much as possible by the duties of each existing stakeholder. However, if the situation worsens, the emergency status will increase from an emergency alert to an emergency response status. This increase in status is, of course, by considering several criteria. At the regency/city level, these characteristics are:

1. Elements of Weather (sourced from BMKG).
    a. Extreme air temperature ≥ 36 degrees Celsius

b. The smog with visibility has disrupted transportation activities.
c. The air transport sector is paralyzed.
d. The education sector is paralyzed.
e. SPI (Standardized Precipitation Index Drought Index based on rainfall: Very Dry.
f. HTH (Rainless Days) information by category length (21 to 30 days without rain in a row)

2. Based on data from the Regency Health Office, the number of sufferers of health problems due to forest and land fires tends to increase.
3. Air Quality (sourced from BLH and or P3E Sumatra)
   a. ISPU (Air Pollution Standard Index) ≥ 300 (Dangerous)
4. Hotspots and Fire Points (sourced from BMKG and the Ministry of Environment and Forestry).
   a. The number of Hotspots increases according to Satellite data.
   b. The emergence of hotspots in several locations.
   c. The number of fires that have yet to be controlled.
5. If points (I), (2), (3), and (4) above are met, the Task Force Command will immediately hold a Coordination Meeting to discuss the latest developments in the situation and whether it is necessary to propose an emergency response status or not.
6. If the Task Force Command Meeting results decide to propose an emergency response status, the Task Force Command will offer an increase in the Emergency Alert status to Emergency Response to the Regent/Mayor through the BPBD.
7. The Regent/Mayor determines the Emergency Response Status in a Regent/Mayor Decree and reports it to the Governor.
8. After receiving a report from the Regent/Mayor, the Governor will assign the Provincial BPBD Executive Head to take the necessary steps and actions per applicable regulations.

In the status of establishing emergency response status at the provincial level, the criteria that must be considered are:

5 The establishment of Emergency Response Status from Regents/Mayors in 2 (two) regencies/cities or more.

6 Elements of Weather (sourced from BMKG).

a. Extreme air temperature ≥ 36 degrees Celsius
b. The smog with visibility has disrupted transportation activities.
c. Air transport is paralyzed.
d. The education sector in several regencies/cities was paralyzed.
e. SPI (Standardized precipitation index Drought index based on rainfall: Very Dry.
f. Information on HTH (Days Without Rain) with long categories (21 to 30 days without rain in a row).

7 The number of sufferers of health problems due to forest and land fires tends to increase based on data from the Riau Provincial Health Office

8 Air Quality (sourced from BLH and or P3E Sumatra).

- ISPU (Air Pollution Standard Index) ≥300 (Hazardous)

5. Hotspots and Fire Points (sourced from BMKG and the Ministry of Environment and Forestry).

a. Number of hotspots increases according to Satellite data.
b. The emergence of hotspots in several locations
c. The number of fires that occur in areas that have yet to be controlled.

2. If points (1), (2), (3), (4), and (5) above are met, the Command Unit will immediately hold a Coordination Meeting to discuss the latest developments in the situation and whether it is necessary to propose an emergency response status or not. Suppose the Task Force Unit Command Meeting results decide to submit an emergency response status. In that case, the Provincial Forest and Land Fire Control Task Force Unit proposes

increasing the Emergency Alert status to Emergency Response to the Governor through BPBD.

3. Based on the provisions in point (6) above, the BPBD holds a Coordination Meeting involving all Disaster stakeholders at the Provincial level to agree on the proposal to establish an Emergency Response Status by taking into account the suggestions and considerations of the competent authorities (Meteorology, Climatology and Geophysics Agency and the Ministry of Environment and Forestry, the Environment Agency, the Sumatra Ecoregion Development Control Center, the Health Service, and other agencies), and then the BPBD proposes in writing to the Governor to establish an Emergency Response Status.
4. Determination of Emergency Response Status is stated in the Governor's Decree
5. With the stipulation of Emergency Response Status, the handling of forest and land fire control by the Task Force Command refers to the provisions of Emergency Response Conditions both from an administrative, budgetary, and operational-tactical aspect by applicable laws and regulations.

Finally, the decision is made to determine the emergency status to become an emergency transition to recovery. These are the criteria for determining the emergency transition status to recovery at the Regency/City Level:

1. Elements of Weather (sourced from BMKG).
    a. Air temperature in a normal situation.
    b. Haze with visibility >1000 m.
    c. SPI (Standardized Precipitation Index/drought index based on rainfall: Dry
2. Air Quality (sourced from BLH and P3E Sumatra).
    i. ISPU (Air Pollution Standard Index) ≤100 (Healthy)
3. Hotspots (BMKG and the Ministry of Environment and Forestry).

a. Hotspot reduced from satellite data.
b. Hotspots experienced a significant decrease.

4. Be active; the community's socio-economic status has returned to normal.
5. There is a recommendation from the relevant agency that it is necessary to carry out recovery activities for the impact of the forest and land fires that have occurred, both related to public health and environmental improvement.
6. the BPBD proposes an Emergency Transition Status to Recovery to the Regent/Mayor based on these recommendations.
7. The Regent/Mayor determines the Emergency Transition Status to Recovery
8. The Regent/Mayor reports the change in status through a decree to the Governor.

Then is decision-making at the Provincial Level related to changing the status of the emergency transition to recovery:

1. Elements of Weather (sourced from BMKG)
   a. Air temperature in a normal situation.
   b. Haze with visibility >1000 m.
   c. SPI (Standardized Precipitation Index/drought index based on rainfall: Dry
2. Air Quality (sourced from BLH and I or P3E Sumatra)
   - ISPU (Air Pollution Standard Index) ≤100 (Healthy)
3. Hotspot (BMKG and the Ministry of Environment and Forestry).
   a. Hotspots are reduced from satellite data.
   b. Hotspots have decreased significantly.
4. Socio-economic activities of the community have returned to normal.
5. At least 2 (two) regencies/cities have established emergency transition status to recovery.

6. There is a recommendation from the relevant agency that it is necessary to carry out recovery activities for the impact of the forest and land fires that have occurred, both related to public health and environmental improvement.
7. The Forest and Land Fire Control Unit Command Meeting results recommended reducing the Emergency Response status to Emergency Transition to Recovery.
8. The governor determines the status change in a governor's decision.
9. Emergency Recovery is carried out until the situation returns to normal.