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Collaborative Governance for Forest and Land Fires Disaster Risk Reduction (DRR) in Central Kalimantan of Indonesia

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Abstract

This research aims to analyze and describe the implementation of collaborative governance in Disaster Risk Reduction (DRR) for forest and land fires. This study used a qualitative approach with a case study in Central Kalimantan of Indonesia, to measure the level of success of DRR collaborative governance in the region. This is carried out by exploring and evaluating the extent to which the principles and dynamics of collaborative governance and the SDGs are implemented. Data was collected through interviews with relevant stakeholders, field observations, and literature reviews. The results show that the implementation of DRR collaborative governance in Central Kalimantan is carried out in several ways, including the formation of the Forest and Fire Prevention Forum (FFPF), development of the Forest and Land Fire Information System, increasing community capacity, and law enforcement. Additionally, the integration of local wisdom in DRR management makes a crucial and impactful contribution. The study's conclusive results demonstrate the effectiveness of collaborative governance in DRR, evidenced by a significant reduction in forest and land fires from 2.6 million hectares in 2015 to 1.5 million hectares in 2023. This research has the potential to significantly enhance the quality of collaborative governance in Disaster Risk Reduction (DRR) in forests and land fires, offering substantial contributions to the development of best practices in disaster mitigation.

Keywords: *Collaborative Governance, Disaster Mitigation, Disaster Risk Reduction (DRR), Forest and Land Fires.*

1. Introduction

Disaster mitigation is an approach that aims to reduce the negative impacts of fire incidents through a series of planned strategies and actions (Chisty et al., 2022; Dimas, 2023; Raharjo, 2022). This disaster mitigation theory involves an in-depth understanding of the factors that cause fires, interactions between stakeholders, as well as effective prevention and risk reduction efforts (Khumairoh et al., 2021; Tamitiadini et al., 2019).

Disaster Risk Reduction (DRR) encompasses a comprehensive set of approaches, policies, strategies, and practices aimed at systematically diminishing the risk and mitigating the impact of disasters on both society and the environment (Sagala et al., 2021). The main objective of DRR is to identify, evaluate and reduce disaster risk factors to protect human life, property, and the environment (Afrian & Islami, 2019). Some of the main principles of DRR involve a deep understanding of disaster risk, prevention, preparedness, mitigation, emergency response, and recovery (Migliorini et al., 2019; Nohrstedt et al., 2022; Seddiky et al., 2020).

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Forest and land fires are a serious problem that is not only local in Central Kalimantan of Indonesia but also has a significant global impact (Garrett et al., 2021; Jeliantika et al., 2022; Risqi, 2022). This phenomenon not only harms local ecosystems and threatens the sustainability of natural resources (Farneubun et al., 2023), but also involves complex relationships with national legal commitments, as stated in various environmental regulations in Indonesia (Syamsuadi et al., 2020; Yusyanti, 2019). Apart from that, efforts to deal with forest and land fire disasters are also relevant to achieving the Sustainable Development Goals (SDGs) which have an environmental dimension (Antonio & Kusuma, 2020; Robertua, 2022; Supriatna, 2021).

Since the 1970s, Indonesia has continued to face serious challenges arising from forest and land fires (Luerdi & Wulandari, 2022; Muzdalifah, 2020; Wijaya et al., 2022). Various causal factors involve deliberate actions, such as clearing fields by burning forests, the practice of campfires by hunters, and camping activities in the forest (Kompas, 2016). According to Gamiyel Josephia (2020) forest fires in Indonesia can mostly be attributed to deliberate human actions, while fires that occur naturally are very rare (Annisa, 2022; Pasai, 2021; Utami & Primawardani, 2021; Yusuf et al., 2019). The motivation for this deliberate action is generally related to accelerating the process of clearing new land, especially for developing plantation areas (Praba Nugraha, 2019; Syah & Aprio, 2021; Yamin, 2021).

The local impacts of these fires include decreased air quality, changes to the landscape and ecosystem, as well as damage to vegetation and fauna, and also contribute to environmental degradation after the fire (Ramadhani et al., 2023). The secondary impacts of these fires also threaten the quality of land and water (Lephen & Theater, 2023; Rimbawan & Nur, 2021). At the global level, forest and land fires create major problems because they contribute to emissions of greenhouse gases and atmospheric particles (Rein & Huang, 2021; Saidal Siburian, MM, & Mar, 2020; Sholikhuddin et al., 2023; Singh, 2022).

Contemporary occurrences of forest and land fires exert repercussions not only at a local level but also on a global scale, presenting intricate challenges that demand a concerted and dedicated response. Consequently, there is an imperative need for proactive mitigation endeavors and collaborative governance that engages diverse stakeholders globally. Such cooperative efforts are essential to effectively and sustainably address these environmental challenges (Bafadal & Hestiantini, 2023; Herfian, 2023; Kusumaningrum et al., 2021; Lumbanbatu et al., 2021).

This research uses a case study approach and qualitative analysis to understand the collaboration between government, non-government organizations, and communities in disaster mitigation. With a Collaborative governance perspective, the research explores the extent to which Collaborative governance and SDGs principles are reflected in DDR collaboration. The novelty analysis of this research will not only include findings regarding the effectiveness of collaborative governance but also investigate the unique contribution of this research to understanding and further development in the field of forest and land fire disaster mitigation.

2. Literature Review

2.1. Previous Researchers

Investigations into collaborative governance for Disaster Risk Reduction (DRR) concerning forest and land fires have emerged as a central area of focus for dedicated researchers striving

to formulate more impactful and sustainable strategies. In the context of this literature review, we will delve into the noteworthy contributions made by previous researchers in understanding collaborative governance within disaster mitigation endeavors. The ensuing section highlights several key studies in the realm of DRR, specifically addressing forest and land fires from the perspective of collaborative governance and its associated theoretical frameworks:

- Maylani & Mashur, (2019) from Jambi University, in their research entitled " Collaborative governance in preventing forest and peatland fires in Bengkalis Regency", explained that collaborative governance is an approach that involves various stakeholders, including government, society, and the private sector, to work together in solving the problem of forest and peatland fires. The theory used in this research is social network theory, which emphasizes the importance of relationships and cooperation between stakeholders.
- Nurlaila, (2023) Serat Acitya from Mbojo Bima University, in his research entitled "Pre-Natural Disaster Management in Bima Regency from a Collaborative Governance Perspective ", explains that collaborative governance can increase the effectiveness of pre-natural disaster management, including forest fires. The theory used in this research is disaster management theory, which emphasizes the importance of planning and coordination between stakeholders in dealing with disasters.
- Holgado-Vargas (2023) provides a systematic review of Forest Fire Risk Management and Territorial Governance. The main goal is to analyze the relationship between these two concepts to find out what is already known and what is not yet known. The research method adapts the model proposed by Martínez et al. (2019) based on the model of Kitchenham et al. (2009), with 3 search phases: planning, implementation, and results. The results of the analysis show that information and research on the relationship between these two concepts is still limited. It is concluded that territorial governance is closely related to forest fire management, especially because many fires are caused by human activities. Therefore, the participation of all parties, especially the community, is considered very important in making decisions regarding forest fire management.
- Hamilton et al., (2021) in their research show that to achieve environmental governance, policymakers need to work together. They face challenges because their responsibilities overlap. The study focused on wildfire risk in Oregon and found that people who work together are more likely to cooperate. Despite this, about 75% of possible collaborations between them did not materialize. In conclusion, this cooperation gap is often overcome by third parties, especially those who do not have the authority to manage the land themselves and whose benefits are more obvious. These findings highlight ways to increase cooperation to reduce risk, particularly by improving coordination among those with interdependent responsibilities.

The findings of previous researchers confirm that collaborative governance plays a central role in overcoming various aspects of forest fires and related risk management. Various theories such as social network theory, disaster management, and adaptation models from Martínez-Usarralde et al., (2019) and Kitchenham et al., (2009) are used to support this view. Even though collaborative governance is still considered a relatively new approach to mitigating fire disasters (Tamitiadini et al., 2019), this concept offers a holistic and integrated solution to managing and mitigating forest and land fire disasters. By focusing on cooperation, participation, and good governance, mitigation efforts can be more effective and sustainable.

2.2. Collaborative Governance Theory

Collaborative governance is a new approach to government governance that involves various stakeholders working together to solve problems and achieve public goals. This approach emerged as a response to the challenges faced by the government in the era of globalization, such as the complexity of problems, limited resources, and increasing societal demands. According to Ansell & Gash (2007) collaborative governance is "a process in which stakeholders from various organizations and backgrounds work together to achieve common goals". These shared goals can take the form of public policies, programs, or projects. Ansel and Gash (2007) identified the six important elements in collaborative governance, according to the data in the table below:

Table 1: Important Elements in Collaborative Governance.

No	Element	Description	The main purpose
1	Shared Commitment	Shared commitment is the most important element in government collaboration. Without shared commitment, collaboration will be difficult to succeed. Joint commitment can be realized in various ways: (1) Formulating a clear shared vision and mission; (2) Sign a collective agreement or agreement; (3) Carry out continuous communication and consultation.	Create a foundation for collaboration and ensure that all parties are actively involved.
2	Cooperation	Collaboration is an important element in realizing shared commitments. Collaboration can be carried out in various ways, such as (1) Sharing resources, information, and knowledge; (2) Cooperating in various activities, such as planning, implementation, and evaluation; (3) Building effective cooperation mechanisms.	Produces more effective and efficient results than individual efforts.
3	Active Participation	Active participation is an important element to ensure that all stakeholders have a voice in the decision-making process. Active participation can be done in various ways, such as: (1) Providing opportunities for all stakeholders to be involved in the process; (2) decision-making; (3) Creating an environment that supports active participation; (3) Listening and respecting all perspectives.	Provides opportunities to incorporate multiple perspectives and knowledge into decision-making.
4	Joint Problem Solving	Collaborative problem-solving is an essential element for producing effective and sustainable solutions. Joint problem-solving can be done in various ways, such as: (1) Identifying common problems together; (2) Developing solutions that suit the needs and aspirations of all stakeholders; and (3) Building consensus about the chosen solution.	Increases the likelihood of finding effective and sustainable solutions.
5	Decision-Making Process	A consensual decision-making process is an important element for building trust and a sense of ownership among stakeholders. The consensual decision-making process can be carried out in various ways, such as: (1) Creating an environment that supports dialogue and consensus; (2) Listening to and respecting all perspectives; and (3) Building a fair and balanced compromise.	Build trust and a sense of ownership among stakeholders.
6	Openness	Openness is an important element in building trust and mutual understanding between stakeholders. Openness can be realized in various ways, such as (1) Accessing information relevant to the collaboration process; (2) Presenting information transparently and honestly; and (3) Building an effective accountability mechanism.	Building trust and shared understanding among stakeholders.

Source: Processed by Researchers, Adopted from the Theory of Ansell and Gash (2007).

These six elements form important foundations for the success of collaborative governance practices. By implementing these six elements, government collaboration can produce effective and sustainable results. Ansell & Gash (2007) suggest that collaborative governance can provide several benefits, including:

- Increase effectiveness and efficiency in solving problems. Collaboration allows stakeholders to share resources and knowledge, resulting in better and faster solutions.
- Increase trust and cooperation between stakeholders. Collaboration can help stakeholders understand and respect each other's interests so that they can build better working relationships.
- Increase government accountability and legitimacy. Collaboration can help the government to involve the public in the decision-making process, thereby increasing public trust in the government.

Ansell & Gash (2007) also stated that collaborative governance faces several challenges, including:

- Complexity: Collaborative governance can be a complex process and requires high skill and commitment from stakeholders.
- Conflict: Collaborative governance can increase conflict between stakeholders, especially if stakeholders have different interests.
- Dependency: Collaborative governance can be a process that depends on the commitment and support of stakeholders.
- Collaborative governance is a complex and dynamic approach. To implement collaborative governance effectively, a deep understanding of theory and practice is required.

Collaborative governance in the context of Disaster Risk Reduction (DRR) reflects an approach that involves active participation and cooperation from various parties, including government, non-governmental organizations, civil society, and the private sector (Cross et al., 2003; Murti & Mathez-Stiefel, 2019). The aim is to create a holistic and integrated framework for managing and reducing disaster risks, especially those related to forest and land fires.

In this model, decisions are taken through a collaborative process involving discussion, negotiation, and involvement of various stakeholders. The principles of transparency, active participation, accountability, and justice are the main pillars of this collaborative dynamic. A deep understanding of the local context, traditional knowledge, and lived experiences of local communities are recognized as important elements in designing effective DDR strategies (Ali et al., 2021; Cuaton & Su, 2020; Rose & Jayawickrama, 2016). Collaboration between stakeholders can also increase efficiency in implementing DRR programs. Through sharing resources, good coordination, and mutual understanding, DDR efforts can be more targeted and effective. In addition, this model encourages innovation in responding to ever-changing disaster challenges by combining expertise from various sectors (Shaw, 2020).

The implementation of collaborative governance in DRR does not only involve parties directly related to forest and land fires but also includes the wider community (Alcántara-Ayala et al., 2022; Ishiwatari, 2022). Community empowerment, education, and capacity building are an integral part of this collaborative effort to achieve the common goal of creating a society that is more resilient to disaster risks. By combining these perspectives, collaborative governance in the context of DRR can become a strong foundation for facing the complex challenges faced by society and the environment related to disaster risk.

In the context of DRR, a collaborative governance approach brings an understanding that cannot be successfully carried out in isolation (Bradley et al., 2022; Emerson et al., 2012; Gollagher & Hartz-Karp, 2013). There needs to be synergy between government, non-government organizations, local communities, and the private sector to create preventive measures and holistic responses. Collaboration here is not just a concept, but an urgent need to face the threat of fire together. Collaborative governance theory emphasizes cooperation and the active involvement of all stakeholders in the decision-making process (Ansell & Gash, 2008; Clark, 2021; Saleh et al., 2021). The application of this theory supports the formation of collaborative governance that benefits all parties involved in mitigating forest and land fire disasters. Through the implementation of collaborative governance, Disaster Risk Reduction (DRR) can become more effective and sustainable. Synergistic cooperation between government, non-government organizations, and local communities is the key to achieving the common goal of protecting ecosystems and human life from the increasing threat of fire (Lassa, 2018; Schweizer et al., 2021).

2.3. Legal Regulations and Policies of the Indonesian Government in Handling Forest and Land Fire Disasters

Forest and land fires are a serious threat to the sustainability of ecosystems, the environment, and human welfare (Muin & Rakuasa, 2023; Nuthammachot & Stratoulias, 2021; Wahyuni & Suranto, 2021). To respond to this challenge, Indonesia has a comprehensive legal framework that regulates forest and land fire disaster management. This scientific review aims to describe and analyze existing regulations and laws in efforts to overcome forest and land fire disasters in Indonesia.

Laws and regulations are the main basis for managing disaster risk in Indonesia. Law Number 24 of 2007 concerning Disaster Management provides the legal basis for disaster management in Indonesia (Harmain, 2022; Isngadi & Khakim, 2021; Kindangen et al., 2021). At the executive level, the National Disaster Management Agency (BNPB) acts as the institution that leads and coordinates disaster management efforts at the national level. Some of the legal regulations in force in Indonesia related to forest and land fire disaster management will shows are in Table 2, below:

Table 2: Forest and Land Fire Disaster Mitigation Laws and Regulations.

No.	Laws and Regulations	Scope	The main purpose
1	Law Number 24 of 2007	Regarding General Disaster Management, including forest and land fires	Establish a legal framework for disaster management in general.
2	Law Number 32 of 2009	Concerning Environmental Protection and Management	Article 69 regulates the responsibilities of the government and society in managing natural disasters, including forest fires.
3	Law Number 11 of 2020	About Job Creation	Article 93 regulates Forest and Land Fire Prevention which includes regulations regarding planning, control, and handling of forest and land fires.
4	Government Regulation Number 57 of 2017	Concerning Disaster Management Implementation of Law Number 24 of 2007	Establish disaster management mechanisms and coordination.
5	Regulation of the Minister of Environment and Forestry Number: P.32/ MENLHK/ Setjen/ Kum.1/5/2018	Regarding Guidelines for Preventing and Managing Forest and Land Fires	Regulate technical guidelines for preventing and controlling forest and land fires.
6	Presidential Instruction Number 15 of 2015	Concerning Improving Forest and Land Fire Management	Emphasizing the urgency of fighting fires and intensifying preventive and rapid response efforts.
7	Minister of Environment and Forestry Regulation Number: P.18/MENLHK/SETJEN/KUM.1/4/2013	Regarding Smoke Control and Prevention of Forest and Land Fires.	Arrange concrete steps in controlling smoke and preventing forest and land fires.

Source: Processed by Researchers, 2023.

The regulations and laws mentioned above, show the Indonesian government's commitment to dealing with forest and land fire disasters. However, challenges remain ineffective implementation, including cross-sector coordination, consistent law enforcement, and active community participation. Through effective implementation and monitoring of this legal framework, Indonesia can strengthen efforts to manage forest and land fire disasters, ensure environmental sustainability, and protect community welfare.

Meanwhile, in the context of disaster risk assessment in Indonesia, involves an in-depth understanding of vulnerabilities, threats, and impacts that may occur as a result of various types of disasters (Nugroho et al., 2023). Disaster risk assessment is an effort to produce information related to the level of disaster risk in an area. The risk level is obtained from a combination of 3 (three) components, namely danger, vulnerability, and capacity. These three components are determined based on their respective parameters. Hazard components are determined through probability analysis (chance of occurrence) and intensity (magnitude of occurrence) (BNPB, 2021).

The vulnerability component is calculated based on four parameters, namely: (1) social vulnerability (exposed population); (2) economic vulnerability (loss of productive land); (3) physical vulnerability (losses due to damage to houses and buildings); (4) and environmental vulnerability (environmental damage). Finally, the capacity component is determined using regional resilience parameters (government sector). The result of combining these three components is risk which provides information regarding the comparison between regional vulnerability and capacity in facing disasters (BNPB, 2021). In other words, the risk level shows the region's ability to reduce the impact of losses arising from disasters. The disaster risk assessment method can be seen in Figure 1.

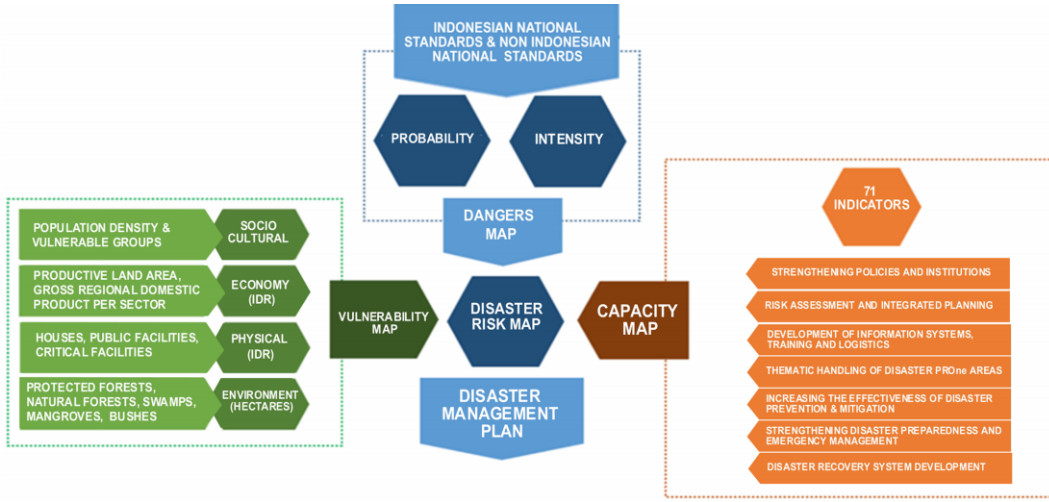

Figure 1: Disaster Risk Assessment Method.
Source : IRBI, 2018; BNPB Regulation No. 12 of 2012, (BNPB, 2021).

The results of the disaster risk assessment are in the form of disaster risk assessment maps and tables. The map provides information about the distribution of affected areas. The resulting maps include hazard, vulnerability, capacity, and risk maps. On the other hand, the study table presents data such as area, number of exposed residents, property losses, environmental damage, and class. From these results, the threat level, loss level, capacity level, and risk level for each hazard can be determined which are classified into low, medium, and high levels (BNPB, 2021).

2.4. Sendai Disaster Risk Reduction Framework 2015–2030 (SFDRR)

The Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR) is a global initiative agreed by member countries of the United Nations (UN) to increase disaster risk reduction efforts throughout the world (Danar, 2020). This framework was adopted at the World Conference on Disaster Risk Reduction held in Sendai, Japan, in 2015. The SFDRR applies for the period 2015 to 2030 and replaces the 2005–2015 Hyogo Framework for Action (HFA), to achieve disaster risk reduction of significant losses in lives, livelihoods, health, and economic, physical, social, cultural, and environmental assets of individuals, businesses, communities, and countries over the next 15 years (Ashu, 2019; Rego, 2022; Roy et al. , 2023).

The SDGs and SFDRR form a global historical foundation for achieving a better and more sustainable future throughout the world (Lucatello & Alcántara-Ayala, 2023). Three SDGs goals covering 11 indicators are monitored and measured by SFDRR, creating strong synergies between the two policy instruments [Figure 2]. The SFDRR has seven targets and four action priorities aimed at achieving significant reductions in disaster risks and losses in the global population, gross domestic product (GDP), and infrastructure. Because SFDRR is the result of interrelated natural, social, and economic processes, it is also closely related to the Sustainable Development Goals (SDGs).

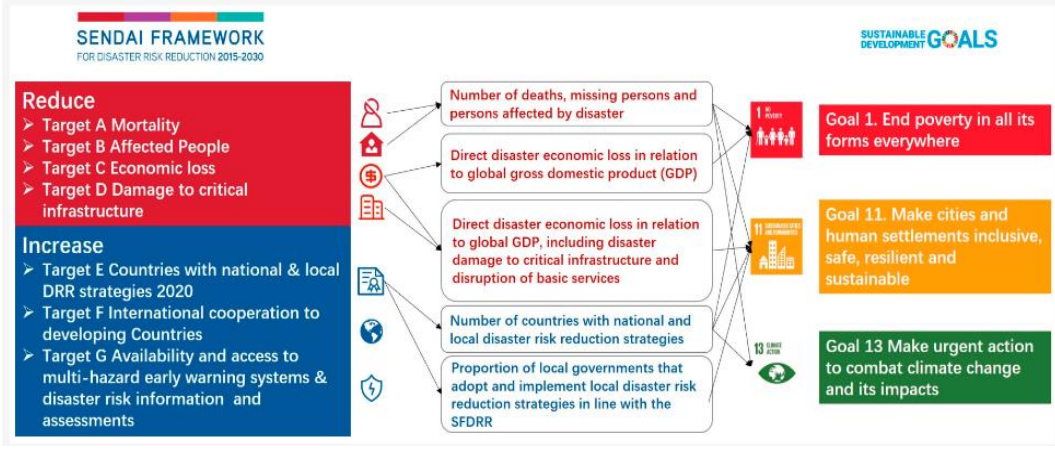

Figure 2. Sendai Framework for Risk Reduction 2015-2030.
Source : UNDDR (2023).

The Sendai Framework outlines seven key targets and four action priorities, which include understanding disaster risk, strengthening disaster risk governance, investing in disaster risk reduction to build resilience, improving disaster preparedness for effective response, and "Build Back Better" in recovery, rehabilitation, and reconstruction (Aitsi-Selmi et al., 2015; Mizutori, 2020; van Niekerk et al., 2020). The Sendai Framework also emphasizes the importance of the role of stakeholders (Hofmann, 2021; Peters et al., 2019), international cooperation, and the availability of a multi-hazard early warning system.

The Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR) is an important framework for reducing disaster risk globally. The implementation of SFDRR in Indonesia still faces several challenges, but the government and all stakeholders have made various efforts to overcome these challenges. The Sendai Disaster Risk Reduction Framework 2015–2030 serves as a global guide for designing disaster risk reduction policies and programs at various levels of government and across sectors (Carrington et al., 2021; Lee & Chen, 2019; Wright et al., 2020).

3. Method

This research adopts a descriptive qualitative approach and case study (Wright et al., 2020), to investigate the implementation of collaborative governance in DRR (Disaster Risk Reduction) for Forest and Land Fires in Central Kalimantan of Indonesia. To understand collaborative dynamics, this research uses collaborative governance theory as a theoretical framework. With this approach, the research aims to provide deeper insight into collaborative governance practices in efforts to implement forest and land DDR in Centr Kalimantan, combining important elements from various theories for a more specific research context.

According to Strauss & Corbin, (2003) one of the advantages of qualitative research is that it is usually used to explain complex details of a phenomenon that is difficult to explain using a quantitative approach. Apart from that, this type of research can be used to study organizations, groups, and individuals.

Theoretical Framework

- Collaborative governance: A collaborative governance approach is applied to understand and analyze collaboration between various stakeholders in disaster mitigation efforts. The focus includes relationships between stakeholders, shared decision-making processes, and coordination effectiveness.
- Disaster Risk Reduction (DRR): This research utilizes the DRR approach as an integral part of the research methodology. DRR is a basis for understanding, analyzing, and detailing the implementation of collaborative governance in disaster mitigation efforts, especially in the context of forest and land fires in Central Kalimantan, Indonesia. By integrating the DRR perspective, the research aims to not only identify effective collaborative governance practices but also measure their contribution to overall disaster risk reduction.

Data Collection Technique

- In-depth Interviews: Involve key stakeholders, such as local governments, NGOs, local communities, and the private sector, to gain insight into collaboration and governance implementation.
- Document Study: Analyze policy documents, disaster mitigation reports, and other related documents to understand the regulatory framework and actions that have been taken.

Data Analysis

- Qualitative Analysis: Involves content analysis to identify patterns, themes, and relationships among qualitative data obtained from interviews and document studies.
- Case Study: In-depth study of several specific forest and land fire cases to understand the implementation of collaborative governance contextually.

Validity and Reliability

- Credibility: Uses triangulation of data from multiple sources and methods to ensure the validity of findings.
- Transferability: Provides a detailed description of the research context to enable readers to generalize findings to similar contexts.

4. Results and Discussion

4.1. Forest and Land Fire Disasters

Cases of Forest and Land Fire Disasters in Kalimantan

Based on the findings in this research, data regarding forest and land fires (FLF) in Central Kalimantan Province in the last five years shows that there is an urgent and complex situation. The increase in the number of hotspots, CO2 emissions, and forest and land fire incidents illustrate the high risk of this disaster in the region. CO2 emissions from Forest and Land Fires (Tons of CO2e) in the Central Kalimantan Province region in 2018 were 34,182,439, in 2019 were 216,133,847, in 2020 were 2,313,223, in 2021 were 909,031, in 2022 were 160,507 and in 2023 were 505,511. The following is a table of CO2 emission data from Forest and Land Fires (FLF) in the Central Kalimantan Province region for the last 5 (five) years:

Table 3: CO2 Emissions from Forest and Land Fires in Kalimantan Province.

No	Year	CO2 Emissions from Forest and Forestry (Tons CO2e)
1	2018	34,182,439
2	2019	216,133,847
3	2020	2,313,223
4	2021	909.031
5	2022	160,507
6	2023	505,511

Source: Central Kalimantan Provincial Government, 2023.

As of August 30, 2023, 8,506 Hotspots (HS) were detected, 1,811 forest and land fire incidents were reported, and the area handled was around 5,569.32 hectares, while the area based on image analysis by the Ministry of Environment and Forestry until July 2023 was 2,948.04 hectares. The largest HS is in East Kotawaringin, Seruyan Regency, and Kapuas Regency. The most reported incidents of forest and land fires were in Palangka Raya City, South Barito Regency, and East Kotawaringin Regency. The largest area of forest and land fires handled is reported in West Kotawaringin Regency, South Barito Regency, and Seruyan Regency. Then, the area of forest and land fires based on image analysis by the Ministry of Environment and Forestry, the largest is Sukamara Regency, West Kotawaringin Regency, and Seruyan Regency.

Table 4: Forest and Land Fires in Kalimantan Province in the Last 5 (five) Years.

No	Regency/City	Forest and land fires area (ha)	Hotspot Point
1	South Barito	19.75	105
2	East Barito	5	22
3	North Barito	52.52	272
4	Mount Mas	0.7	3
5	Kapuas	3	15
6	Katingan	34.19	182
7	West Kotawaringin	128.9	645
8	East Kotawaringin	48.83	250
9	Lamandau	17.41	85
10	Murung Raya	66.69	330
11	Palangka Raya City	61.89	315
12	Pulang Pisau	6.5	30
13	Seruyan	13.8	67
14	Sukamara	183.66	920
	Total	**642.84**	**2,375**

Source: Central Kalimantan Provincial Government, 2023.

Based on the data analysis, it is evident that Sukamara Regency stands out as the district with the most extensive occurrences of forest and land fires in Central Kalimantan, encompassing an expansive area of 183.66 hectares. Following closely is West Kotawaringin, ranking as the second-largest district with a significant area affected by forest and land fires, totaling 128.9 hectares. The third position is held by North Barito, covering an area of 52.52 hectares in forest and land fires.

Sukamara Regency emerges as the district with the highest number of hotspot points in Central Kalimantan, registering a substantial 920 points. Following closely is West Kotawaringin, securing the second position with 645 hotspot points. North Barito holds the third spot with 272 hotspot points. Given these statistics, there is a pressing need to intensify efforts in preventing and addressing forest and land fires in Central Kalimantan. These proactive measures can be implemented through heightened public awareness campaigns regarding the hazards of forest and land fires. Additionally, increased supervision of land clearing activities and the provision of adequate facilities and infrastructure for managing forest and land fires are essential components of a comprehensive strategy to mitigate the impact of such incidents.

The issue of forest and land fires (FLF) poses a significant challenge for Indonesia, particularly in the context of Central Kalimantan. These fires have become a recurrent annual occurrence, leaving a trail of adverse effects on the environment, economy, and public health. The origins of forest and land fires in Central Kalimantan can be categorized into two main groups: natural causes and human-induced causes. Natural causes encompass meteorological factors, such as prolonged dry seasons and elevated air temperatures, as well as weather-related elements like strong winds and heavy rainfall. Geological factors also play a role in this category. On the other hand, human causes include intentional land burning for purposes such as clearing agricultural land or establishing plantations, burning land for the extraction of firewood or on peatland, burning land for fishing activities, and burning land as part of traditional ritual practices. The multifaceted nature of these causes underscores the complexity of addressing and mitigating forest and land fires in Central Kalimantan.

Forest and land fires in Central Kalimantan cause various negative impacts, including (1) Impact on the environment, such as forest damage, air pollution, and climate change; (2) Impact on the economy, such as economic losses, disruption of economic activities, and decline in the quality of agricultural products; (3) Impact on public health, such as respiratory problems, eye irritation, and skin diseases.

The Indonesian government has made various efforts to deal with forest and land fires in Central Kalimantan, including (1) Establishing a Forest and Forestry Task Force; (2) Implementing an early warning system for forest and land fires; (3) Increasing law enforcement against forest and land fire perpetrators; (4) Community empowerment in preventing forest and land fires; (5) Apart from that, the government also collaborates with various parties, such as non-government organizations (NGOs), the private sector and the community, to deal with forest and land fires. Forest and land fires in Central Kalimantan are a complex problem and require comprehensive handling. Efforts to handle forest and land fires must be carried out in a coordinated and sustainable manner, involving all parties.

Vulnerability of Forest and Land Fires (FLF) in 2023 in the Central Kalimantan Peat Hydrological Unity (KHG) Area

2023 will be an important period in understanding and handling vulnerability to Forest and Land Fires (FLF) in the Central Kalimantan Peat Hydrological Unity (KHG) Region. As a

region rich in peat ecosystems, Central Kalimantan faces serious challenges related to forest and land fires which can trigger significant ecological and social impacts. The following is a Figure 3 of Forest and Land Vulnerability in Central Kalimantan 2023:

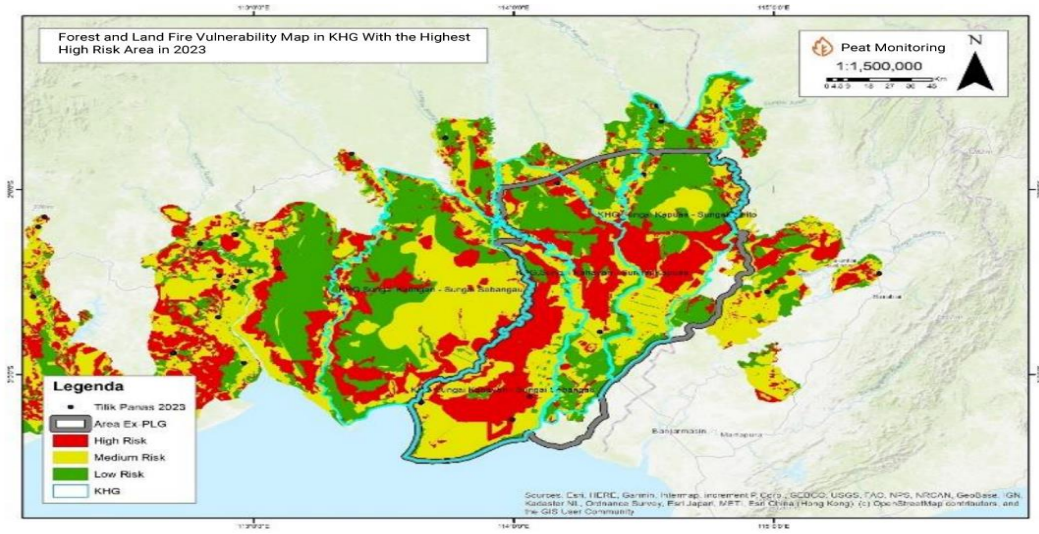

Figure 3: Forest and Land Fire Vulnerability Map 2023.
Source: The Provincial Government of Central Kalimantan, 2023.

Table 5: Forest and Land Vulnerability in Central Kalimantan 2023.

No	KHG name	Area (Ha)	Vulnerability (ha)	High	Medium	Low
1	KHG Kahayan River - Sebangau River	451,507	190,395	222,377	38,735	-
2	KHG Katingan River - Sebangau River	823,060	160,896	366,300	295,865	-
3	KHG Kapuas River - Barito River	558,168	139,598	212,868	205,701	-
4	KHG Kahayan River - Kapuas River	400,320	118,444	124,601	157,275	-

Source: The Provincial Government of Central Kalimantan, 2023.

Between 2015 and 2019, a staggering 4.4 million hectares of peatlands in Indonesia succumbed to fires, with over half of this extensive area being peatland. Furthermore, 789,600 hectares endured repeated burns during this period. It is crucial to underscore that the mapped 1.3 million hectares of fire-affected regions during this timeframe were concentrated in palm oil and pulp concession areas. These findings raise significant concerns, particularly considering that in 2015, Indonesia ranked as the fourth-largest global producer of greenhouse gases. Notably, deforestation and peat forest fires emerged as the primary contributors to this alarming level of emissions.

Certainly, the recurrence of extensive forest and land fires akin to those in 2015 and 2019 is undesirable in 2023. The cyclical nature of the El Niño climate anomaly, occurring every four years, should serve as a motivation for all stakeholders to uphold their commitment to safeguarding the peat ecosystem. In light of this, Monitor Peat (Gambut) conducted a study on the vulnerability of forest and land fires and concession areas in Indonesia for the year 2023.

4.2. Handling Forest and Land Fire Disasters in Central Kalimantan

In the field of disaster management, two closely intertwined concepts frequently encountered are disaster mitigation and Disaster Risk Reduction (DRR). These two elements are intricately connected and inseparable. Disaster mitigation involves concerted efforts to diminish the risks associated with disasters, achieved through a combination of physical development, heightened awareness, and the enhancement of capacities to confront potential disaster threats. On a broader scale, DRR constitutes a global framework unanimously adopted by the international community to systematically reduce disaster risks.

Implementation of Disaster Risk Reduction (DRR) for Forest and Land Fires in Central Kalimantan

Central Kalimantan is one of the provinces in Indonesia that is prone to forest and land fires (FLF). This is caused by several factors, including (1) The geographical conditions of Central Kalimantan, which mostly consists of flammable peat forests; (2) The long dry season in Central Kalimantan, which increases the risk of forest and land fires; (3) Land clearing activities for plantations and agriculture, which are often carried out by burning.

In 2015, forest and land fires in Central Kalimantan reached 2.6 million hectares, which is one of the largest forest and land fires that has ever occurred in Indonesia. The forest and land fires caused a huge impact, on the environment, economy, and public health. To reduce the risk of forest and land fires, the Indonesian government has made various efforts, including DRR efforts. DRR efforts for forest and land fires in Central Kalimantan can be grouped into two, namely: (1) Disaster mitigation efforts, which are carried out to reduce the risk of forest and land fires occurring; (2) Disaster preparedness efforts, which are carried out to prepare the community to face forest and land fires.

Efforts to mitigate the forest and land fire disaster in Central Kalimantan are carried out through various activities, including (1) Hotspot monitoring and evaluation, which is carried out to detect and monitor forest and land fire hotspots; (2) Prevention and control of forest and land fires, carried out by patrolling, outreach and law enforcement; (3) Peatland rehabilitation and restoration, which is carried out to reduce the vulnerability of peatlands to fire.

Forest and land fire disaster preparedness efforts in Central Kalimantan are carried out through various activities, including (1) the Formation of a disaster management team, consisting of various elements, such as government, community, and private sector; (2) Disaster risk mapping, which is carried out to determine potential disaster risks in an area; (3) Establishment of an early warning system, which is carried out to provide early warning to the public if forest and land fires occur; (4) Increasing community capacity, carried out through various activities, such as training and simulations.

Forest and land fires (FLF) are natural disasters that can have huge impacts, on the environment, economy, and public health. To reduce the risk of forest and land fires, comprehensive management efforts involving various parties are needed. Forest and land fire management can be carried out at various levels, from the national level to the local level. At the national level, forest and land fire management is carried out by various central and regional government entities, which have different roles and responsibilities. The entity responsible for and the role of managing forest and land fires (FLF) is a crucial aspect in efforts to mitigate and control disaster risks at the national level. Several entities that have a key role in managing forest and land fires include government agencies, meteorological services, academics, and various related ministries.

Table 6: Entities Responsible for Implementing DRR in Central Kalimantan.

The Role of Forest Fire Management	Responsible Entity
Forest Fire Risk Assessment	Government research institutions, meteorological services, and academia have an important role in conducting forest fire risk assessments. Through scientific studies and meteorological analysis, they can identify potential risks and provide information on which to base mitigation policies.
Awareness of Forest Fire Risk	Awareness of the risk of forest fires is a shared responsibility of institutions such as the Ministry of the Environment, civil protection agencies, and meteorological services. They play a role in conveying information to the public and stakeholders to increase understanding of the risks of forest and land fires.
Fuel and Ecosystem Management	The Ministry of Environment, Ministry of Agriculture, and subordinate institutions have responsibility for fuel and ecosystem management. They are involved in ecosystem maintenance activities that can reduce the potential for fires as well as land management to mitigate risks.
Land Use Planning and Building Regulations	The Ministry of Public Works (PU), Ministry of Home Affairs, and Ministry of the Environment together with land use institutions have a role in land use planning and building regulations. This is to control human activities that can trigger forest and land fires.
Emergency Preparedness and Response	Emergency management, including the Civil Protection Agency and the fire department, along with several forest services, are responsible for emergency preparedness and response. They are involved in fire extinguishing and evacuation efforts if necessary.
Monitoring and Early Warning	Government research institutions and meteorological services have a role in monitoring and early warning. They provide information about hotspot development and meteorological conditions that can be used to warn of potential fires.
Post-Fire Recovery	Ecological restoration after forest fires is the focus of the Ministry of the Environment and related institutions. These steps include land rehabilitation, replantation, and restoration of affected ecosystems.

Source: Processed by Researchers, 2023.

In this research, it was also found that there was a role for local wisdom in implementing Disaster Risk Reduction (DDR) related to forest and land fires in Central Kalimantan, Indonesia, showing a significant positive impact. Local wisdom, which includes traditional knowledge, values, and practices of local communities, has formed a strong foundation for disaster mitigation efforts. Local wisdom makes a valuable contribution to forest and land fire risk management. Local people's in-depth knowledge of local ecosystems and traditional practices is an important resource in the prevention, early detection, and management of disasters.

Local wisdom reflects the ability of local people to adapt to the natural environment. Sustainable practices such as wise land management and the choice of fire-resistant crops reflect a community's adaptability to fire risk. Local wisdom is not only limited to ecological aspects but also involves social aspects. Community-based early warning systems, coordination in evacuation, and post-disaster recovery demonstrate the social involvement of local communities in DDR efforts. Involving local wisdom in planning and implementing DDR policies is a key step. Collaboration with traditional institutions, community leaders, and local communities can create more holistic, contextual, and sustainable solutions.

Furthermore, this research reveals a direct association between the effective implementation of Disaster Risk Reduction (DRR) strategies and the realization of sustainable development goals, notably SDGs 1, 11, 13, and 17. The synergy of collaborative initiatives in mitigating disaster risks not only safeguards lives and assets but also contributes to the broader agenda of sustainable development, fostering the creation of safer, more inclusive, and disaster-resilient communities. This correlation is illustrated in the findings presented in Table 7 below:

Table 7: Implementation of DRR towards Achieving SDGs in Central Kalimantan.

SDG's Target Goals	Implementation
	**SDG No: 1 - No Poverty:** The implementation of DRR in the context of forest and land fires contributes to SDG No.1, by directly involving communities that are vulnerable to poverty. Preventing and mitigating the risk of forest and land fires can maintain the sustainability of the livelihoods of local communities that depend on natural resources. Preventive measures also prevent economic loss and ensure that the devastating impacts of fires do not exacerbate inequality and poverty.
	**SDG No: 11 - Sustainable Cities and Communities:** Forest and land fire risk management within the DRR framework supports SDG No: 11, by emphasizing the sustainability of cities and communities. The strategy for dealing with forest and land fires includes coordination between local government, communities, and the private sector to create cities and villages that are safe from disaster risks. The arrangement of urban and village areas by considering forest and land fire risk mitigation also supports the development of disaster-resistant infrastructure.
	**SDG No: 13 - Action Against Climate Change:** DRR's steps in addressing the risk of forest and land fires are in line with SDG No: 13, which highlights the need for action on climate change. Forest and land fires not only trigger local fires but can also cause significant greenhouse gas emissions. By involving DRR, disaster risk mitigation efforts can contribute to global efforts to tackle climate change and maintain ecosystem balance.
	**SDG No: 17 - Partnership for the Goals:** The DRR framework in handling forest and land fires promotes the principle of SDG No: 17, regarding partnerships for goals. Cross-sectoral collaboration, involving government, society, and the private sector, is key to managing disaster risk effectively. This partnership creates synergy between various parties to strengthen capacity, share resources, and increase the sustainability of disaster risk mitigation efforts.

Source: Processed by Researchers, 2023.

The implementation of DRR on forest and land fires, as mentioned above, plays a central role in achieving some sustainable development goals promoted by the Sustainable Development Goals (SDGs). The focus on sustainability, inclusiveness, and disaster risk mitigation reflects a commitment to achieving positive transformation in various aspects of community life and the environment. By guiding the implementation of DRR in preventing forest and land fires by SDGs No: 1, 11, 13, and 17, the hope is to create a safer, more sustainable, and inclusive environment for all levels of society.

Implementation of DRR Collaborative Governance for Forest and Land Fires in Central Kalimantan

Forest and land fires (FLF) are natural disasters that can have huge impacts, on the environment, economy, and public health. Central Kalimantan is one of the provinces in Indonesia that is prone to forest and land fires. To reduce the risk of forest and land fires,

comprehensive management efforts involving various parties are needed. One approach that can be used is collaborative governance.

The implementation of collaborative DRR forest and land fire management in Central Kalimantan has resulted in a significant reduction in the area of forest fires, from 2.6 million hectares in 2015 to 1.5 million hectares in 2023. However, public awareness, community capacity, and law enforcement still need to be improved. Further efforts to improve coordination and cooperation between relevant parties will ensure the continuation of effective forest and land fire management in Central Kalimantan.

Collaborative governance is a management approach that involves various parties, including government, society, and the private sector. This approach emphasizes the importance of coordination and cooperation between parties to achieve common goals. The implementation of collaborative DRR forest and land fire management in Central Kalimantan has been carried out through various activities, including those described in the following table:

Table 8: Implementation of DRR Activities and Stakeholders in Central Kalimantan.

No.	Activity	Objective	Stakeholders
1	Establishment of the Forest and Fire Prevention Forum (FPPK):	Coordinate efforts to prevent and control forest and land fires	Government, society, and the private sector
	a. Regular meetings to discuss prevention and control	Increase coordination and cooperation between related parties	Government, society, and the private sector
	b. Formulate policies and programs	Develop strategies and action plans to prevent and control forest and land fires	Government, society, and the private sector
	c. Socialization of the dangers of forest and land fires	Increase public awareness about the dangers of forest and land fires	Government, society, and the private sector
	d. Patrol and surveillance	Prevent and take action against perpetrators of forest and land fires	Government, society, and the private sector
2	Development of Forest and Land Fire Information System (DFLIS)	Increase the effectiveness of monitoring and evaluation of efforts to prevent and control forest and land fires	Government
3	Collection, processing, and presentation of forest and land fire data	Get accurate and integrated data to support decision-making	Government
4	Increasing Community Capacity:	Increase public knowledge and skills about the dangers of forest and land fires and ways to prevent forest fires	Government, society, and the private sector
	a. Face-to-face learning	Convey information and knowledge about the dangers of forest and land fires directly to the public	Government, society, and the private sector
	b. Campaigns and outreach	Disseminate information and education about the dangers of forest and land fires through various media	Government, society, and the private sector
	c. Training	Equipping the community with skills and knowledge to prevent forest and land fires	Government, society, and the private sector
5	Law enforcement	Providing a deterrent effect on perpetrators of forest and land fires	Government
	a. Improve coordination and cooperation	Increase the effectiveness of law enforcement	Government, society, and the private sector
	b. Socialization about the importance of law enforcement	Increase public awareness about the importance of law enforcement	Government, society, and the private sector
	c. Increased budget for law enforcement	Strengthen support for law enforcement efforts	Government

Source: Processed by Researchers, 2023.

Although collaborative governance in forest and land fire disaster mitigation in Central Kalimantan is already going well, it still needs to be improved, especially in terms of (1) Increasing public awareness about the dangers of forest and land fires; (2) Public awareness about the dangers of forest and land fires still needs to be increased. There are still many people who burn land to clear agricultural land or plantations; (3) Increasing community capacity to deal with forest and land fires. Community capacity to deal with forest and land fires also needs to be increased. Communities need to be equipped with skills and knowledge on how to prevent and extinguish forest fires; (4) Law enforcement against perpetrators of forest and land fires. Law enforcement against forest and land fire perpetrators needs to be improved to provide a deterrent effect; (5) Increased coordination and cooperation between related parties also need to continue to be improved to ensure the effectiveness of forest and land fire management in Central Kalimantan.

This research comprehensively identifies some stakeholders involved in Disaster Risk Reduction (DRR) efforts related to forest and land fires in Central Kalimantan. These stakeholders include various entities, such as government, non-governmental organizations, academics, and local communities. The following is a table and explanation of several stakeholders who have an important role in DRR in Central Kalimantan:

Table 9: Capacity and Role of Stakeholders in Disaster Risk Reduction (DRR).

No.	Stakeholders	Capacity and Role
1	Central Kalimantan Regional Government	▪ Develop and implement DRR policies. ▪ Coordination in emergency response and fire fighting.
2	Regional Disaster Management Agency (BPBD)	▪ Handle overall disaster management. ▪ Coordinate mitigation and emergency response efforts.
3	Non-Governmental Organizations (NGOs)	▪ Provide assistance in understanding and implementing DRR. ▪ Play a role in community outreach and education.
4	Academics	▪ Conduct research and provide scientific insight. ▪ Contribute to the development of DRR policy and practice.
5	Local Community	▪ Participate in risk mitigation activities. ▪ Convey important information related to disaster risk.

Source: Processed by Researchers, 2023.

Each stakeholder has a special role in disaster risk mitigation efforts. Regional governments and BPBD have a central role in planning, organizing, and implementing mitigation actions. NGOs and academics help by providing knowledge and resources to support DRR implementation. Meanwhile, the active participation of local communities is key to the sustainability of mitigation efforts. It is important to remember that cooperation between stakeholders is essential, and effective collaboration between them can increase the capacity and responsiveness of the entire DRR system in Central Kalimantan.

Based on the findings in this research, it show that the implementation of collaborative governance of DRR and forest and land fires in Central Kalimantan has been carried out well and has had positive results. However, forest and land fire disaster mitigation efforts in Central Kalimantan still need to be improved, especially in terms of increasing public awareness about the dangers of forest and land fires, increasing community capacity to deal with forest and land

fires, and enforcing the law against forest and land fire perpetrators. Collaborative governance is a form of partnership between various parties to achieve common goals. Therefore, the implementation of collaborative governance of DRR and forest and land fires in Central Kalimantan can be categorized as an effort to strengthen partnerships to achieve sustainable development goals.

5. Conclusion

Based on the presented research findings, a compelling conclusion emerges the implementation of collaborative governance in Disaster Risk Reduction (DRR) for forest and land fires in Central Kalimantan has demonstrated significant success. Notably, the expansive area affected by forest fires in Central Kalimantan has witnessed a remarkable reduction, plummeting from 2.6 million hectares in 2015 to 1.5 million hectares in 2023. This unequivocally underscores the efficacy of disaster mitigation efforts in the region, successfully mitigating the risk of forest and land fires. A more detailed synthesis of conclusions derived from the research results can be succinctly conveyed as follows:

The implementation of collaborative governance in Disaster Risk Reduction (DRR) for forest and land fires in Central Kalimantan achieved success by adopting the main principles of collaborative governance. This framework involves stakeholders from government, society, and the private sector actively working together to identify, understand, and address disaster risks. The principle of collaborative governance emerged through initiatives through the formation of the Forest and Forestry Prevention Forum (FPPK) and the development of the Forest and Land Fire Information System, showing solid coordination between various parties to achieve common goals. Joint decisions and active participation are key in planning and implementing risk mitigation strategies.

The involvement of local communities and other stakeholders is recognized as a crucial element in implementing the principles of collaborative governance. Through open dialogue and consultation, diverse views and local wisdom are integrated, creating holistic and sustainable solutions for risk mitigation. In addition, the involvement of the private sector shows that the principles of collaborative governance have succeeded in overcoming traditional obstacles and optimizing joint potential to achieve more effective results. This collaboration not only creates continuity in funding and resources but also expands the necessary networks and support. Overall, the implementation of collaborative governance in DRR for forest and land fires in Kalimantan has succeeded in aligning itself with the principles of collaborative governance.

The implementation of collaborative governance in forest and land fire DRR in Kalimantan reflects strong alignment with the principles contained in the Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR). SFDRR principles, which emphasize understanding disaster risk, strengthening capacity, and increasing stakeholder involvement, are reflected in every aspect of implementation. Strengthening capacity, which is one of the main principles of SFDRR, is reflected in the active participation of stakeholders from various sectors. From government to local communities and the private sector, this engagement provides a foundation for strengthening the capacity to respond to and reduce the impact of forest and land fires.

The implementation of collaborative governance in DRR for forest and land fires in Kalimantan has succeeded in achieving close conformity with the principles contained in the

Sustainable Development Goals (SDGs). Relevant SDGs include, among others, No: 1 (No Poverty), No: 11 (Sustainable Cities and Communities), No: 13 (Action on Climate Change), and No: 17 (Partnership for the Goals). Thus, the implementation of collaborative governance in DRR for forest and land fires in Kalimantan not only meets the relevant SDGs goals but also makes a positive contribution to overall sustainable development efforts.

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