

Advancing collaborative management in Bukit Rimbang Baling Wildlife Reserve, Riau, Indonesia

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Abstract. Collaborative management (CM) in protected areas refers to a system in which multiple stakeholders actively participate in managing protected areas (PAs). The collaboration can take various forms, ranging from government-led to community-based approaches. Bukit Rimbang Bukit Baling Wildlife Reserve (BRBB WR), Central Sumatra is known as a long-term priority Sumatran tiger (*Panthera tigris sumatrae*) landscape globally. At the same time, the local and traditional communities have been inhabiting the area for hundreds of years and generally have livelihoods that are closely related to the nearby natural resources, including rubber products and other natural resources. This study examines the challenges of managing BRBB WR, identifying the gap, and exploring collaborative strategies to balance conservation and sustainable livelihoods. The study employs a descriptive analysis approach using interviews, focus group discussions, and direct field observations. Findings highlight key challenges, including illegal activities within the reserve, limited community awareness of regulations, restricted management capacity, and a lack of inclusive collaborative planning. Strengthening CM strategies requires enhancing leadership capacity, establishing inclusive partnerships with key stakeholders, and implementing joint monitoring and evaluation frameworks. These efforts are essential for ensuring effective conservation while supporting the well-being of local communities within BRBB WR.

1 Background

Emerging in the 1990s, collaborative management (CM) in protected areas refers to a system in which multiple stakeholders—including government agencies, local communities, NGOs, private entities, researchers, and experts—actively participate in decision-making and management processes within protected areas (PAs). This approach has been widely adopted to address common challenges in PA management, such as limited funding, weak enforcement, and the dependence of local communities on these areas for their livelihoods

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[1,2]. CM of protected areas has been implemented in various regions, including co-management initiatives in African countries, Northern Norway, and the United States, each with distinct governance and management arrangements [3-5]. In Indonesia, its implementation has been supported by the Directorate General of Natural Resources and Ecosystem Conservation Regulation No.P.6/2018, which provides technical guidelines for conservation partnerships within nature reserves and conservation areas. The collaboration can take various forms, including shared decision-making, community engagement, and capacity building for key individuals involved in management [1]. This way, PAs in Indonesia, which are still predominantly managed by the government, can integrate CM through participatory approaches to address existing gaps in the field. Examples of efforts that have been implemented are the establishment of the Bunaken National Park Advisory Board (*Dewan Pengelola Taman Nasional Bunaken - DPTNB*) to support Bunaken National Park in North Sulawesi [6], the community involvement in the management effort of Karimunjawa National Park in Central Java [7], and the CM of Sultan Syarif Hasyim Forest Park in Riau, Central Sumatra, which applies a strategic resource management approach [8]. Another example is Kutai National Park with Mitra Kutai which consists of eight companies bordering Kutai National Park. Mitra Kutai offers a partnership model that provides financial resources and technical assistance to the national park. Mitra Kutai is the first example of a partnership in Indonesia and has provided an important model in supporting partnership as a key aspect of participatory conservation management [9].

The Bukit Rimbang Bukit Baling landscape, located in Riau, Central Sumatra, is recognized as a long-term global priority for the conservation of the Sumatran tiger (*Panthera tigris sumatrae*) and an important link for tiger movement to the north and south along the Bukit Barisan Mountain Range, and the east to Bukit Tigapuluh National Park. In addition to that, there are at least 4 other wildcats, namely clouded leopards (*Neofelis diardi*), golden cats (*Catopuma temminckii*), leopard cats (*Felis bengalensis*), marbled cats (*Felis marmorata*). Furthermore, the floral diversity of SM-BRBB consists of 104 identified plant species, excluding orchids and the tiger-faced Rafflesia (*Rafflesia hasseltii*). Spanning approximately 500,000 hectares of the landscape, 141,226.25 hectares of this area have been designated as a wildlife reserve under Decree No. SK.3977/Menhut-VII/KUH/2014 as known as Bukit Rimbang Bukit Baling Wildlife Reserve (BRBB WR) [10]. BRBB WR is managed by the state, in this case through the Conservation Forest Management Unit (CFMU/*Kesatuan Pengelolaan Hutan Konservasi/KPHK*) under the supervision of the Riau Natural Resources Conservation Agency (BBKSDA Riau). BBKSDA Riau itself has the task of implementing the conservation of natural resources and ecosystems in nature reserves, wildlife reserves, nature tourism parks, and hunting parks, as well as technical coordination of the management of botanical forest parks and essential ecosystem areas in Riau Province and Riau Islands Province based on the Regulation of the Minister of Environment and Forestry Number: P.8/MenLHK/Setjen/OTL.0/1/2016.

Before its designation as a wildlife reserve, indigenous communities have inhabited the area for centuries. The earliest historical record documenting the presence of Indigenous communities in the BRBB Landscape dates back to the Pamalayu Expedition of the Singhasari Kingdom in the 13th century (before the Majapahit Kingdom) [11]. Predominantly influenced by Minangkabau and Malay culture, the region today includes seven villages within the wildlife reserve, all located in Kampar Kiri Hulu Sub-District: Subayang Jaya, Terusan, Aur Kuning, Gajah Bertalut, Tanjung Beringin, Batu Sanggan, and Sungai Santi. Additionally, 18 other villages intersect with the reserve, including Muara Bio and Tanjung Belit in Kampar Kiri Hulu Sub-District. Communities in and around the wildlife reserve maintain livelihoods deeply intertwined with the surrounding natural resources. Approximately 94% of residents in Terusan, Aur Kuning, Gajah Bertalut, Tanjung Beringin, and Batu Sanggan villages located within the reserve rely primarily on rubber farming as

their main source of income [12,13]. The remote location of these villages, deep within the forest and accessible only by river using 'piyau' canoes, has further solidified their dependence on natural resources for daily sustenance, including wild fruits, forest vegetables, and fishing in the rivers [13]. Natural rubber, agarwood, and freshwater fisheries are several non-timber forest products (NTFPs) that have the potential to be developed into sustainable products and become the main livelihoods for the community in the fields of agriculture and fisheries [13].

The area also possesses significant potential for ecosystem services and ecotourism, offering a diverse range of nature-based activities. In addition to a suitable location for large mammal observation and research, the region is also a prime location for birdwatching, with opportunities to observe species such as the white-rumped shama, oriental magpie-robin, and other endemic birds along forest trails and riverbanks. Similarly, primate observation can be conducted along the river or within primary and secondary forests, with common sightings of long-tailed macaques (*Macaca fascicularis*), siamang (*Symphalangus syndactylus*), and agile gibbons (*Hylobates agilis*). The forest also hosts the rare red-and-white Rafflesia (*Rafflesia hasseltii*), a critically endangered parasitic plant protected under Government Regulation No. 7 of 1999 and Ministry of Environment and Forestry No.P.106/MenLHK/Setjen/KUM.1/12/2018 and categorized as endangered on the IUCN Red List. Locally known as "Cendawan Muka Rimau", this species adds to the region's botanical uniqueness [10]. Beyond its natural attractions, BRBB WR also offers cultural tourism experiences, such as "Lubuk Larangan"—a community-managed fish conservation practice where local customs dictate that fishing is prohibited for a certain period [14]. In the ecotourism sector, adventure tourism opportunities include river trekking and hiking through primary forests along the Subayang River as the main river cuts through the landscape, where visitors can observe traditional local farming and livestock practices, as well as daily riverine life as local communities travel upstream and downstream using *piyau*. Trekking routes traverse muddy forest trails, allowing visitors to experience the rich biodiversity, including Dipterocarpaceae trees, wild orchids, and diverse wildlife. One of the most notable natural attractions in the area is Batu Dinding Waterfall, located in Tanjung Belit Village [15]. This combination enhances both conservation efforts and tourism appeal by offering visitors the chance to witness and participate in sustainable local practices.

Parts of the BRBB Landscape also intersected with operational concessions far before the designated degree, such as the industrial forest plantation (HPHTI) of PT. Riau Andalan Pulp and Paper (APRIL Group) is in the eastern area, and coal exploration activities are being done by PT. Manunggal Inti Artamas and PT. Nusa Riau, and forest concessions (HPH) activities of PT. Brajatama I, PT. Brajatama II, and PT. Union Timber in some parts of the forest [11]. The presence of communities within the reserve, combined with its proximity to various concessions, has created non-ideal conditions, posing significant threats to the area's security and presenting unique management challenges for the BRBB WR. In the context of CM, partnerships can be conceptualized along a spectrum ranging from full governmental control to complete community-based management [1]. Conservation of natural resources and ecosystems is the responsibility and obligation of the Central Government and Local Government as well as the community based on Law No.32 of 2024. Biodiversity and ecosystem conservation, and collaborative management have been formally recognized through Ministry of Forestry Regulation No. P.19/Menhut-II/2004. The regulation provides a framework for stakeholders to engage in conservation efforts, enhancing both the effectiveness of protected area management and the well-being of local communities. CM can enhance the benefits of the reserve for local populations while addressing potential conflicts among stakeholders. Additionally, it can improve governance by providing a platform for dialogue and negotiation among various parties. This study aims to examine the challenges in managing BRBB WR, identify existing gaps, and explore collaborative

strategies to achieve effective conservation while supporting sustainable livelihoods within the reserve.

2 Material and method

This study uses descriptive exploratory methods and analyzes qualitative data. The data used are secondary and primary data obtained through interviews and Focus Group Discussions (FGD) with the key stakeholders at the provincial, district, and village levels in 2023-2024. Interviews were conducted in seven villages, namely Tanjung Belit and Muara Bio, which are located in the buffer zone, as well as Batu Sanggan, Tanjung Beringin, Gajah Bertalut, Aur Kuning, and Terusan, which are situated within the Rimbang Baling Wildlife Reserve. A total of 93 participants (65 male, 28 female) were interviewed, including village officials, community leaders, district-sub-district government, local government, and provincial government. The inclusive approach, involving all community components, aimed to obtain comprehensive information regarding the actual situation in the field from multiple perspectives.

The FGD involved key individuals engaged in management, program implementation, activities, or residing within and around the Rimbang Baling Wildlife Reserve. A total of 90 participants represented four community groups, one Indigenous community, 15 government institutions at the village, district, and provincial levels, two academic institutions, 15 local and national NGOs, three international NGOs, three expert practitioners, six private sector entities, and three media. The FGD covered four main topics: (1) Community Involvement in Conservation, (2) Effectiveness of Managing Human-Sumatran Tiger Interactions, (3) Sustainable Financial Support for Sumatran Tiger Conservation Efforts, and (4) Ecology and Carrying Capacity of Sumatran Tiger Habitat. FGD is part of the triangulation of information obtained from the key stakeholders, and the secondary data results from existing policies. Direct observation in the field was also conducted as a validation to support the data collected.

3 Results and discussion

Conservation area management has experienced a paradigm shift from being solely government-controlled to embracing broader stakeholder participation, a trend that has gained global traction, including in Indonesia. The Bukit Rimbang Bukit Baling Wildlife Reserve, managed by the CFMU under the supervision of BBKSDA Riau, oversees two operational units: Bukit Rimbang Resort and Bukit Baling Resort, is one of several PAs that have started implementing this approach. Comprehensive information regarding the attempts is divided into (a) Challenges; (b) Existing gaps; (c) Strengthening strategies; and (d) Enabling conditions.

3.1 Challenges in Bukit Rimbang Bukit Baling Wildlife Reserve

Illegal logging, wildlife poaching, land encroachment – Disruptions to the area from illegal logging, forest encroachment, and wildlife poaching persist within BRBB WR. The reserve is relatively accessible, particularly along the Subayang River as one of two main rivers within the landscape [16]. The limited enforcement of laws by the relevant authorities exacerbates this issue. From the private sector perspective, the presence of unmonitored land clearings and concession roads near the reserve poses additional threats [17]. It provides access to perpetrators of illegal activities such as logging and poaching that threaten tigers,

other wildlife species, and their habitats. These openings also provide access for encroachment, increase the risk of human-wildlife conflict, and fuel envy among local communities within the reserve, who may wish to convert land into more profitable commodities, such as oil palm plantations. Illegal logging remains a significant issue due to insufficient law enforcement by the responsible authorities. Local sources and direct observation found these activities are often carried out by individuals within the communities familiar with the local terrain to supplement their income. However, some perpetrators come from outside the area. However, markets and networks supporting these illegal activities facilitate their continuation.

Environmental impacts of coal mining around BRBB WR – Coal mining activities spanning approximately 3,000 hectares near the reserve present significant environmental risks and social conflicts [18]. These include habitat destruction, potential harm to local settlements from using explosives, damage to local vegetation, and pollution of the Kampar River and its tributaries, which flow through the wildlife reserve. Furthermore, the PT Manunggal and PT Nusa Riau, which operated from 1995-1996 in the southeast part of the landscape, also failed to close and rehabilitate the land they had cleared [17]. Without proper oversight and law enforcement, this risk could occur again with the concessions currently operating around the landscape area and potentially affect the ecological integrity of the Rimbang Baling area.

Lack of public understanding of the block management system: restrictions on community access to forest resources, as well as community perception of the constitutional Court Decision No. 35 on Customary Forests – The Government of the Republic of Indonesia issued Government Regulation No. 28 of 2011 on the Management of Nature Reserves (*Kawasan Suaka Alam/KSA*) and Nature Conservation Areas (*Kawasan Pelestarian Alam/KPA*). This regulation mandates that the management of *KSAs* and *KPAs* includes the development of zoning or management blocks. The management unit must carry out the process of zoning or block designation with due consideration of public consultation outcomes involving local communities surrounding the *KSA* or *KPA*, as well as provincial and/or district governments. BBKSDA Riau has prepared a Management Plan Document for BRBB WR Sanctuary from 2017 to 2026. Based on the BRBB WR Management Plan, the long-term management vision of BRBB WR is '*The realization of sustainable and equitable management of the Bukit Rimbang-Bukit Baling Wildlife Sanctuary under its functions and designations*' with the area divided into four management blocks. The Protection Block stretches across 117,897.4 hectares, the Rehabilitation Block with 5,822.32 hectares, the Special Block with 17,348.50 hectares, and the Religion, Culture, and Historical Blocks with 0.33 hectares. The designation of these blocks incorporates prior historical considerations to ensure alignment with existing local contexts and traditions [19].

Based on the interviews with the communities, one of the primary issues is the lack of understanding regarding the block system. Communities have limited awareness of the purpose of each block or its boundaries, leading to confusion. Additionally, the block system imposes restrictions on activities such as rubber tapping and the harvesting of NTFPs, particularly for individuals with ancestral rubber plantations located within protection blocks as it is designated as a concentration area for the Sumatran tiger and other protected species, characterized by low levels of human activity and threats [19]. At least, 3,278,67 hectares across 5 villages within the reserve, or 9,4% of community-owned rubber plantations are located within it [20,21]. This limitation can reduce community income, restrict access to natural resources, create conflicts between local villagers and reserve authorities, and high transaction and management costs for local communities involved in establishing community-based projects. The lack of understanding about block-specific regulations also increases the risk of unintentional legal violations by community members unaware of

activities deemed illegal. Another source of tension stems from differing interpretations of Constitutional Court Decision No. 35 on Customary Forests (*hutan adat*), which affirms that customary forests are located within ancestral territories and are not state forests. At least, 94,75% or 14,695.91 out of 15,509.63 hectares of customary forests are located within and divided into protection, special, and utilization blocks. This situation could create disputes between Indigenous communities who might feel their rights are not respected, leading to legal challenges and uncertainty over forest management.

Limited human resource capacity for BRBB WR Management – Based on CFMU information, the human resource capacity for managing the area under CFMU-BRBB WR is limited. Two resorts are operated, Bukit Rimbang Resort and Bukit Baling Resort, each staffed with only five personnel responsible for safeguarding the area of 141,226.25 hectares. In addition, the BRBB WR faces constraints in budget allocation, both of which require significant enhancement to ensure effective management and conservation efforts. The BRBB WR requires comprehensive and effective management as a matter of urgency.

3.2 Existing gaps

Collaborative governance processes have begun to take shape in the management of BRBB WR. Several joint initiatives have yielded tangible outcomes, including partnerships with NGOs to support on-the-ground sustainable conservation efforts and the development of alternative livelihoods for local communities, participatory land use planning for villages within and adjacent to the reserve which involves communities and BBKSDA staff [20], community-based patrol and monitoring systems which the BBKSDA Riau has recognized for their role in safeguarding the area [22], and rural infrastructure development within the reserve built with regional (*Anggaran Pendapatan dan Belanja Daerah/APBD*) and village budget (*Anggaran Pendapatan dan Belanja Daerah Desa/APBDes*) [23]. However, despite these advancements, several gaps remain, hindering the optimal effectiveness and impact of these collaborative processes.

Leadership as a driving factor in collaborative management – Pomeroy (1996) in Wiratno (2024) [24] defined collaborative management as a range of responsibilities and/or authorities between government and local resource users in managing a particular resource. Based on that, the role of CFMU-BRBB WR as the primary facilitator of collaborative management is essential. This includes addressing management challenges inclusively while maintaining the area's status as a Wildlife Reserve. However, limited human resources and institutional capacity within the CFMU pose significant challenges to effectively leading inclusive collaboration. With a constrained staff, the CFMU struggles to oversee all collaborative activities, which may impede its ability to manage these processes effectively. To address this, CFMU must enhance its capacity in resource management, communication, conflict resolution, and implementing CM principles. These principles include transformative responsibility management, sustainable development, good governance, evidence-based decision-making, and precautionary principles.

Pentahelix collaboration in BRBB WR Management – A pentahelix strategy involving the government, academics, communities, businesses, and the media strengthens conservation efforts [25]. The Pentahelix collaboration model integrates five key sectors: government, academia, private sector, communities, and media. While collaborative initiatives within SM-BRBB have largely involved government agencies, local communities, NGOs, and media, academia and the private sector engagement remains limited. Private sector involvement can play a crucial role in conservation by acting as off-takers for non-timber forest products such as rubber, rattan, and agarwood, thus supporting sustainable

livelihoods. Meanwhile, academic institutions can contribute by conducting research and analysis to informing evidence-based decision-making and improve conservation outcomes.

Inclusive collaborative management planning – BRBB WR is currently managed under the 2017-2026 Management Plan, which aims to enhance stakeholder cooperation and promote community partnerships. The existence of communities located in the block management needs to be encouraged to build joint institutions [19]. However, this plan was formulated primarily from the perspective of BKSDA Riau, the designated authority at the time, and does not clearly define the roles and responsibilities of multiple stakeholders in CM. Developing a Collaborative Management Plan is necessary, involving all relevant stakeholders to ensure a more comprehensive, strategic, and inclusive approach. This plan should address emerging conservation challenges and identify shared strategies, roles, joint action plans, and mechanisms for monitoring and evaluation, ensuring that all stakeholders are actively involved.

Funding for joint action plans – A significant challenge in managing BRBB WR is the limited funding for management activities conducted by the CFMU-BRBB WR. While regional and village funds have supported some infrastructure development in villages within the area, these funding sources remain insufficient. On the other hand, the community within the BRBB WR builds joint regulation or agreement in supporting the management of BRBB WR as mentioned in the BRBB WR management plan (2017-2026) [19], which has included several main strategies, as follows: development, assistance and empowerment of communities around and within the BRBB WR area; increase synergy and cooperation with stakeholders in supporting the management of the BRBB WR area; develop information and promotion of the BRBB WR area; restoration of the BRBB WR area; encourage research and development activities on the potentials contained in the BRBB WR area; increase the quantity and capacity of human resources managing the BRBB WR area; increase the quantity and capacity of human resources managing the BRBB WR area.

3.3 Strengthening strategies

Effective conservation governance requires evidence-based decision-making, ensuring that policies and management strategies are grounded in reliable data and scientific research [26]. This process includes problem identification, data collection and analysis, evidence quality evaluation, solutions development, and ongoing monitoring of their impact [27]. To enhance conservation efforts in BRBB WR, a Collaborative Management Framework can help assess and improve existing management strategies. This framework provides a clear structure for understanding the key elements for effective policymaking and implementation. In BRBB WR, CM can be strengthened by focusing on system context, driving factors, governance structures, key stakeholders, shared motivation, and collective capacity. All the collaborative frameworks recognize the importance of formal and informal rules and protocols, institutional design, and other structural dimensions for sustainable collaboration. Most also identified leadership as an important element. The impact of this approach includes better protection of habitats and wildlife, as well as improved accessibility and connectivity between villages. Furthermore, lessons learned from current collaborative governance efforts can guide future partnerships and help identify financial resources to support joint conservation initiatives.

Enhancing leadership capacity of CFMU-BRBB WR as a key driver for collaborative management – Effective leadership within KPHK SM-BRBB is crucial for fostering CM and addressing sustainability challenges, including the complexity and dynamic nature of issues within the area. Strengthening leadership capacity requires developing systematic and dialogical thinking skills essential for navigating these complexities. Leadership should prioritize processes, communication, dialogue, and

information gathering from diverse sources in this context. This can be achieved through targeted training programs on effective collaborative management. Strengthened leadership within CFMU-BRBB WR is expected to serve as a driving force for more effective and inclusive collaborative governance. As mentioned in the BRBB WR management plan that important to increase the quality and capacity of human resources as the leader in managing the BRBBWR area [19]. Human resources leadership will provide stronger collaborative management with relevant stakeholders, including communities located in and around conservation areas such as BRBB WR.

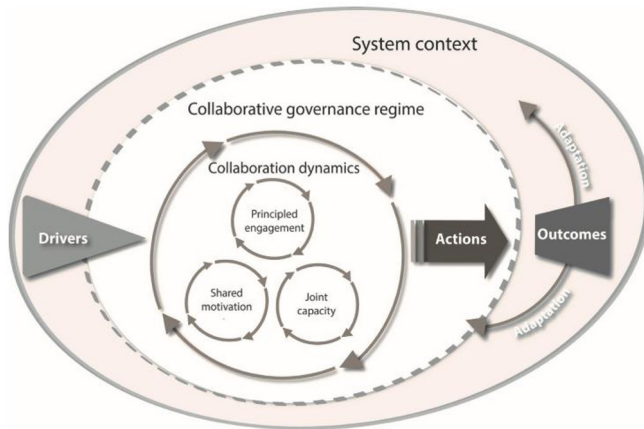


Fig. 1. Collaborative Management Framework [28]

Identifying key stakeholders for collaborative management – As an important area for biodiversity and ecosystems as well as life support, especially for humans, Bukit Rimang Bukit Baling SM area also faces environmental problems and pressures on its sustainability, so a good management model is needed by involving parties and paying attention to several biophysical, socio-cultural, economic, and policy aspects [29]. The current CM approach in SM-BRBB primarily involves government agencies (BBKSDA Riau and CFMU), local governments, communities/villages, and the media. However, expanding stakeholder engagement to include the private sector and academic institutions is essential for strengthening collaborative efforts. Previous research conducted on rubber commodity development and NTFPs, including market chain analysis, provides valuable insights for identifying private sector actors who can contribute to sustainable livelihood development in SM-BRBB. Additionally, academic institutions and research organizations should be actively involved in conducting studies related to conservation management. Engaging both the private sector and academia is expected to enhance the effectiveness and sustainability of CM efforts in BRBB WR.

Raising stakeholder awareness for conservation – Strengthening shared motivation among stakeholders is essential for effective conservation efforts in BRBB WR. With the existence of the community and its management space, the management of Bukit Rimang Bukit Baling Wildlife Reserve prioritizes community-based conservation area management. Patterns of community empowerment, involvement, and awareness are important strategies deemed necessary in building understanding and awareness of the conservation of natural resources and ecosystems [29].

This requires awareness-raising initiatives focused on area management, particularly the block management system. The role of mass media, including the Community Radio established in the BRBB WR region, is crucial in disseminating information and fostering stakeholder awareness.

Developing an inclusive collaborative management plan – An inclusive Collaborative Management Plan should be developed, incorporating current strategic issues, management strategies, stakeholder engagement (including social and gender inclusion), joint action plans, and measurable success indicators. This plan should reflect the collective capacity of stakeholders in implementing joint conservation efforts.

Establishing multi-stakeholder partnerships – Collaborative partnerships should be formalized through Memorandums of Understanding (MoUs) between CFMU-BRBB WR and relevant stakeholders. These may include agreements with local governments for infrastructure development, village authorities to grant access to non-timber forest products, and private sector actors as off-takers for sustainable community-based livelihoods.

Joint monitoring and evaluation strategy – A joint monitoring and evaluation strategy is necessary to assess the progress and outcomes of the collaborative action plans based on predefined indicators. This process is also critical for iterative planning, ensuring conservation strategies remain adaptive to the dynamic challenges in BRBB WR.

3.4 Enabling conditions

This effort can only be effectively implemented if key enabling conditions are in place. These conditions include supportive policies for CM at the site level, the Technical Guidelines for Conservation Partnership in Nature Reserves and Conservation Areas, and comprehensive baseline data analysis to assess challenges and explore alternative solutions. Furthermore, collaboration with community-based organizations can enhance the effectiveness of stakeholder engagement. Examples include the Lintas Subayang Inter-village Communication Forum (Forum Komunikasi Antar Desa Lintas Subayang/FKAD), a village government forum dedicated to the development of villages along the Subayang River, and the Subayang Multi-Stakeholder Forum, a community group focused on human resource development in the same area. These platforms serve as intermediaries, facilitating dialogue and cooperation between stakeholders and local communities, including customary leaders and village governments, to ensure inclusive and sustainable conservation efforts.

CM is a decision-making approach that brings together communities, government agencies, private organizations, and civil society to work toward shared conservation goals. By actively involving local communities, CM fosters a stronger sense of ownership, recognizes their rights, and strives for the integration of expert and local knowledge, leading to more effective conservation outcomes. This approach also raises awareness and public support by including communities in decision-making. Additionally, CM integrates conservation with sustainable livelihoods and infrastructure development, benefiting both people and nature. It helps reduce conservation costs by distributing responsibilities among local stakeholders who actively contribute to protecting their environment. CM also plays a key role in conflict resolution, encouraging cooperation between communities and conservation organizations to find mutually beneficial solutions. Moreover, it builds local capacity by empowering communities with the skills and knowledge to manage conservation initiatives effectively. This not only ensures long-term sustainability but also improves data collection and monitoring, as local insights contribute to better conservation planning and implementation.

4 Conclusion

BRBB WR faces significant management challenges, including disturbances to the area and limited capacity among stakeholders. CM is essential to address issues related to biodiversity conservation, ecosystem sustainability, and equitable access to natural resources for

livelihoods. Effective management of BRBBWR should adhere to principles such as alignment of stakeholder responsibilities, sustainable development, good governance, evidence-based decision-making, and the precautionary principle. Key gaps in CM effort in RBRW WR include weak regional leadership, insufficient Penta helix collaboration, and the absence of an inclusive management plan. Strengthening strategies involves building the capacity of CFMU-BRBB WR, defining stakeholder roles, and incorporating gender and social inclusiveness into collaborative planning. Additionally, understanding the enabling conditions for sustainable management can ensure long-term success.

To enhance collaborative governance, it is essential to improve the leadership role of area stakeholders, particularly BBKSDA Riau, by strengthening human resources and management capacity aligned with collaborative management principles. Stakeholder involvement must be inclusive, engaging the Penta helix model, which includes local governments, communities, NGOs, media, academia, and the private sector, to ensure diverse perspectives and resources contribute to the area's management. A comprehensive and inclusive Collaborative Management Plan should also be developed, detailing joint action steps, clear roles, success indicators, and a robust monitoring and evaluation framework for all involved parties. Additionally, communication platforms like the Inter-Village Communication Forum (*Forum Komunikasi Antar Desa/FKAD*) and the Subayang Forum should be optimized to maintain dynamic discussions on area protection and sustainable use. Integrating a Specific Area Development Plan can further align local and village government efforts toward rural development in BRBB WR. Conservation partnerships with villages should also be established to empower communities and restore ecosystems through collaboration with local groups. These measures will create a sustainable foundation for effective collaborative governance in BRBB WR.

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