



THE ROLE OF STAKEHOLDERS IN PRESERVING THE HABITAT OF THE WHITE-FRONTED LANGUR (*Presbytis frontata*) IN THE TELUK KELUMPANG NATURE RESERVE, SOUTH KALIMANTAN, INDONESIA

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ARTICLE INFO	ABSTRACT
Article History: Received: 15 October 2025 Revised: 21 May 2026 Accepted: 6 August 2026 Published: 15 September 2026 Keywords: Penta-helix, stakeholders, power-interest matrix	Wildlife habitat conservation in protected areas increasingly involves complex governance arrangements that require collaborative engagement among multiple stakeholders. This study analyses stakeholder roles, interaction dynamics, and power relations in the conservation of white-fronted langur (<i>Presbytis frontata</i>) habitat using a penta-helix framework. A qualitative approach was employed through in-depth semi-structured interviews, policy document analysis, and limited field observations. Thematic analysis was complemented by stakeholder mapping using a power-interest matrix to assess levels of influence and interest among actors. The findings indicate that government institutions and the business sector occupy dominant positions in decision-making and implementation owing to their regulatory authority and control over resources. In contrast, local communities demonstrate strong conservation interest but possess limited influence within formal governance structures. Academics contribute scientific knowledge and technical support, while the media plays a role in information dissemination and public awareness; however, the involvement of these actors remains weakly institutionalised. The power-interest matrix reveals a governance gap whereby existing collaborations remain predominantly functional rather than transformative. This study contributes theoretically by demonstrating that integrating the penta-helix framework with the power-interest matrix provides an effective analytical tool for identifying power imbalances and participation gaps in conservation governance. The findings underscore the importance of collaborative governance arrangements that deliberately address power asymmetries and promote meaningful stakeholder participation to ensure long-term wildlife habitat conservation.

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Introduction

Biodiversity conservation in tropical forest areas is increasingly facing serious challenges due to increasing pressure from human activities such as deforestation, land clearing, mining, and plantation expansion (Li, 2025). In Indonesia, the loss of forest cover continues to be a significant environmental concern that directly affects the degradation of wildlife habitats, especially for endemic species with restricted distribution

(Sushadi, 2023; Jesus, 2024). Ongoing habitat fragmentation not only limits the range of wildlife but also disrupts the availability of food and shelter, threatening the long-term viability of populations (Sievers *et al.*, 2025; Uzun & Evcin, 2025).

One of the endemic animals affected by this condition is the white-fronted langur, an arboreal primate found only on the island of Borneo,

both in Indonesia and Malaysia (Najmuddin *et al.*, 2020; Mubaraq *et al.*, 2023). This species requires relatively intact forest ecosystems to survive; therefore, changes in land cover increasing anthropogenic activities constitute significant threats to its persistence. The white-fronted langur is increasingly observed outside protected areas, like in community gardens and company concessions. This trend is attributed to ongoing habitat degradation, which makes it more likely that people and animals will be in conflict due to habitat overlap and land-use pressures (Mubaraq *et al.*, 2023).

The Teluk Kelumpang Nature Reserve (TKNR) in Kotabaru Regency, South Kalimantan, Indonesia, is a crucial habitat for the white-fronted langur. The reserve supports diverse flora and fauna characteristic of the lowland tropical forest ecosystem. Although formally protected, the Teluk Kelumpang Nature Reserve remains vulnerable to external pressures such as land-use change, mining activities, and habitat fragmentation. (Juniyanti *et al.*, 2021; Mwangosi *et al.*, 2025). This issue suggests that a solely state-centred conservation approach is insufficient to ensure long-term habitat protection.

Various studies show that effective management of conservation areas requires the involvement of multiple parties or stakeholders, including governments, local communities, the private sector, academics, and the media (Neta & Kagungan, 2018; Sutata *et al.*, 2023). This collaborative approach becomes increasingly relevant in the context of a landscape that has become fragmented and dominated by economic interests (Cockburn *et al.*, 2020). Combining conservation goals with economic development goals is seen as a more realistic and long-lasting way to do things, as long as there is clear governance, a fair division of roles, and a good way to coordinate (Soekmadi *et al.*, 2025).

The penta-helix model, comprising five principal components—government, society, business, academia, and media—facilitates the analysis of stakeholder collaboration and their respective roles in habitat conservation

initiatives (Sari *et al.*, 2024). This concept is increasingly utilised in sustainable development research, particularly in the realm of ecotourism development (Anh *et al.*, 2022; Hidayat *et al.*, 2024). Compared with conventional stakeholder approaches, the penta-helix framework offers a more integrative perspective by recognising the role of knowledge production and public communication alongside regulatory and economic actors. This framework is particularly relevant in conservation governance contexts, which are characterised by overlapping institutional authorities, community dependency on natural resources, and increased private sector involvement in land use and resource management. However, its application in wildlife conservation in Indonesia remains significantly constrained, particularly regarding empirical studies conducted at the site level.

In this context, the study seeks to examine the roles, contributions, and interactions of stakeholders in the preservation of the white-fronted langur habitat within the Teluk Kelumpang Nature Reserve. The main goal of this research is not to look at the species' biological or ecological aspects, but rather at how stakeholders work together and govern themselves in a conservation setting. The findings are expected to contribute to a better understanding of multi-stakeholder collaboration in wildlife conservation and to support the development of more adaptive and collaborative conservation governance approaches.

Materials and Methods

Location and Time of Research

The research was conducted in the Teluk Kelumpang Nature Reserve (TKNR), Kotabaru Regency, South Kalimantan Province, and in the surrounding area, which serves as a buffer zone and for other uses. Most interviews were conducted in Geronggang Village, the nearest settlement to the Teluk Kelumpang Nature Reserve, where stakeholders directly interact with the conservation area and its surrounding landscape (Figure 1). The site selection was based

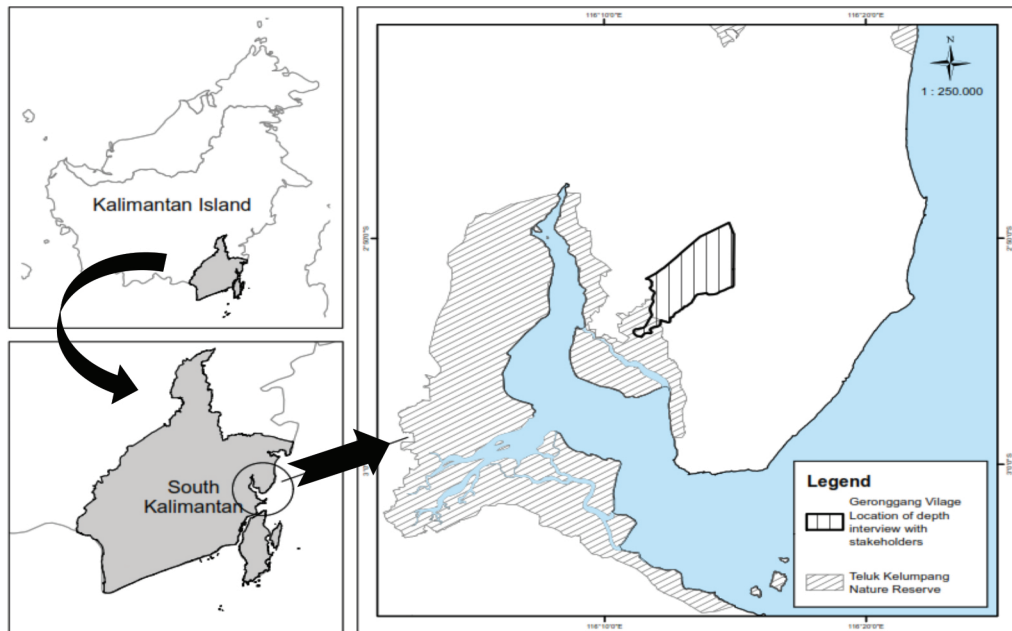


Figure 1: Research location map

on the presence of white-fronted langur habitat, some of which lies outside formal conservation areas, thus involving various stakeholders and management actors. Fieldwork was conducted in 2023–2024, depending on the availability of informants and ongoing conservation activities.

Research Design and Approach

This approach was selected to explore stakeholders' experiences, perceptions, and perspectives of stakeholders concerning habitat conservation initiatives for the white-fronted langur in the Teluk Kelumpang Nature Reserve. A qualitative methodology was considered most suitable as the research concentrated not on quantitative assessments of animal populations but on governance processes, the roles of participants, and the dynamics of interactions among stakeholders within the conservation framework (Ehrhart *et al.*, 2021).

Data Collection Technique

Data were collected through several techniques to ensure the depth and validity of the information.

In-depth Interviews

Semi-structured interviews were conducted with key informants representing five stakeholder groups (Creswell, 1994). One key informant representing each stakeholder category was purposively selected based on their experience, institutional role, and direct involvement in conservation activities related to the Teluk Kelumpang Nature Reserve, namely: (1) Government agencies authorised to manage conservation areas, namely the South Kalimantan Natural Resources Conservation Agency (BKSDA South Kalimantan) (*Balai Konservasi Sumber Daya Alam Kalimantan Selatan*/South Kalimantan Natural Resources Conservation Agency); (2) local communities living around the area; (3) private parties operating in the area around TKNR, namely PT Arutmin Indonesia Site Senakin; (4) academics or researchers from Lambung Mangkurat University who are involved in conservation studies and assistance; and (5) local media “Kabarone”, which plays a role in disseminating conservation information. The selection of informants was carried out purposively based on their involvement and

knowledge of the issue of preserving the white-fronted langur habitat.

Document Analysis

We looked at four written sources, i.e., conservation laws and regulations (Regulation of the Minister of Environment and Forestry Number: P.106/MenLHK/Setjen/Kum.1/12/2018); reports on area management activities (Activity Report: Joint Patrol in Teluk Kelumpang Nature Reserve 2023 (BKSDA South Kalimantan, 2023); documents about cooperation between agencies (Cooperation Agreements numbers PKS.3558/K.16/TU/KJS/8/2022 and 468.a/AI/VIII/22); and news articles by “Kabarone” that were relevant. These documents were used to triangulate and validate information obtained from interviews (Tanur *et al.*, 2024).

Limited field observations were performed to comprehend the context of the research site, the overall state of the habitat, and the specific manifestations of stakeholder activities in the field. These observations were not intended for ecological inventory but rather to strengthen understanding of the interview results and documents (Hanum, 2024).

Data Analysis Techniques

The roles, contributions, and interaction dynamics of the five stakeholder groups were analysed thematically of interactions between five stakeholder groups in efforts to conserve the habitat of the white-fronted langur in the TKNR is analysed thematically based on the penta-helix framework (Nurhaida *et al.*, 2024). The influence and level of interest of stakeholders on an object are analysed qualitatively using a power–interest matrix approach (Grimble *et al.*, 1995; de Groot *et al.*, 2002). The horizontal axis of the power–interest matrix represents the level of stakeholder interest in habitat conservation, while the vertical axis represents stakeholder power or influence over decision-making processes. Based on these dimensions, stakeholders were classified into four quadrants: Players (high power–high interest), subjects

(low power–high interest), context setters (high power–low interest), and the crowd (low power–low interest). This approach facilitates the identification of governance gaps, participation inequalities, and strategic collaboration opportunities.

Data Validity

Data validity was maintained through source and method triangulation techniques, namely by comparing interview results between informants, interview results with documents, and field observation findings. Furthermore, researchers double-checked key information through informal discussions with informants to minimise misinterpretation (Meydan & Akkas, 2025).

Research Ethics

This study adheres to ethical principles of social research. All informants were interviewed after receiving an explanation of the research objectives and consenting to participate. The informants’ identities are not included in the manuscript and are presented as stakeholder categories to maintain confidentiality and ensure the respondents’ comfort (Kaiser, 2009).

Results and Discussions

Conservation Governance within a Penta-helix Framework

The research results are presented thematically based on a penta-helix framework to describe the roles, contributions, and dynamics of interactions between five stakeholder groups in efforts to conserve the white-fronted langur habitat in the TKNR (Figure 2).

Role of Government

The government, through agencies that manage conservation areas, plays a central role as regulator and coordinator in habitat preservation efforts. The government’s primary role includes establishing area protection policies, monitoring activities in and around

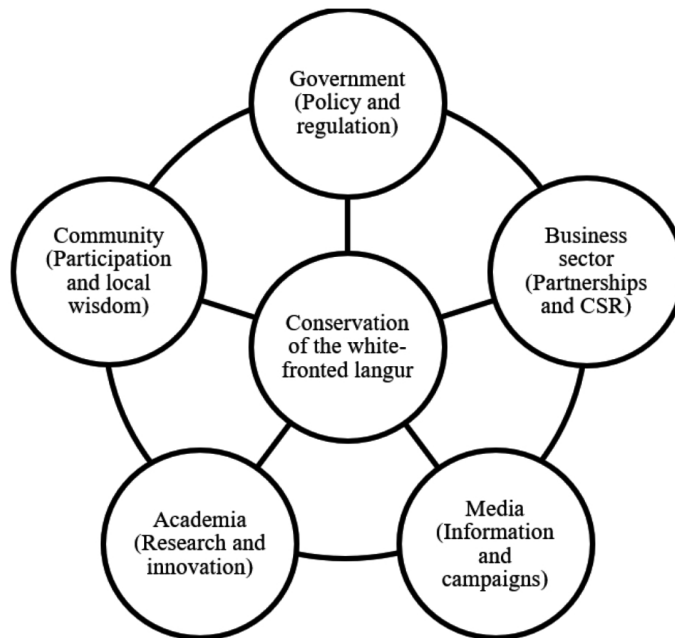


Figure 2: Penta-helix framework of white-fronted langur conservation

nature reserves, and facilitating collaboration with other parties (Xu *et al.*, 2012). The government agency with the primary mandate for the conservation of biological natural resources in the research area is the BKSDA South Kalimantan. Based on the regulation of the Minister of Environment and Forestry Number P.14/MenLHK/Setjen/Kum.1/2/2017, the BKSDA South Kalimantan has the following primary functions: (a) Protection and security of plants, wildlife, and their ecosystems; (b) preservation of biodiversity; (c) conservation education and outreach; (d) handling of human-wildlife conflicts; and (e) implementation of conservation cooperation and permits.

An informant from the BKSDA South Kalimantan confirmed that the successful conservation of the white-fronted langur habitat was greatly facilitated by a partnership with the business sector (PT Arutmin Indonesia Site Senakin), as part of the animal's habitat lies outside the formal conservation area and within the company's operational area. The collaboration includes joint patrols, educational and outreach activities for

schools and community groups, wildlife conflict management training, and support for conservation infrastructure. The government also facilitated the establishment of the white-fronted langur Conservation Community Group in Geronggang Village to make it easier for the government and the local community to talk to each other.

However, informants also said that the principal challenge concerns engagement and communication with local community groups. This is especially true since conservation activities have not yet brought direct economic benefits to the community. On the other hand, the shared function of education and information dissemination makes collaboration with academics and the media relatively easier. Several other activities across different countries have reported similar conditions (McDevitt, 2021; Rampheri *et al.*, 2022).

Research results indicate that limited human resources and budgets result in suboptimal area monitoring, particularly in conservation area boundaries. Cross-sectoral coordination is still hard, especially when it comes to balancing

conservation goals with economic activities in the area. Even though there are rules and management plans that say what should happen, implementation remains highly dependent on support and involvement of non-governmental groups.

The Role of Local Communities

People who live near the nature reserve have a direct connection to the forest as a place to live and work (Saha & Agarwalla, 2021). Interview results indicate that the community has local knowledge regarding the presence and behaviour of the white-fronted langur and exhibits a relatively positive attitude towards the animal. Informants from local community leaders stated that the white-fronted langur does not cause disturbance to gardens and fields, so it is not perceived as a pest or economic threat. Local communities spearheaded their participation in collaborative conservation efforts under the leadership of the “white-fronted langur” Conservation Area Lovers Community Group.

Furthermore, the community expressed its readiness to participate in habitat and wildlife conservation efforts, either with the BKSDA South Kalimantan or the company, as long as the activities could be tailored to their schedule and activities in the village. The community expressed an interest in cultivating economically valuable plant species that simultaneously serve as food resources for the white-fronted langur, ensuring that conservation and welfare can coexist harmoniously.

In practice, the community primarily fulfils its role through informal activities, including informal monitoring of conservation areas and wildlife presence reporting. However, the community’s participation in formal conservation activities remains limited. The main obstacles to encouraging active participation are economic factors, limited access to information, and a lack of incentive schemes (Noor *et al.*, 2024). This finding shows that the community has not been fully positioned as a subject of conservation governance but is still in a passive supporting position (Arifalo, 2024).

The Role of the Private Sector

Businesses operating around conservation areas significantly influence habitat conditions (Njamasi *et al.*, 2022). In this case, the business in question is PT Arutmin Indonesia Site Senakin. Informants from business actors stated that the company’s involvement in area conservation is realised through cooperation agreements numbers PKS.3558/K.16/TU/KJS/8/2022 and 468.a/AI/VIII/22, which refer to the Regulation of the Minister of Environment and Forestry Number 44 of 2017.

PT Arutmin Indonesia Site Senakin is a coal mining company operating in Kotabaru Regency, South Kalimantan Province, Indonesia. Part of its operational and concession areas are located adjacent to the Teluk Kelumpang Nature Reserve and overlap with several ecological corridors used by the white-fronted langur. Although the company has contributed to conservation initiatives through collaborative programmes, mining activities and associated infrastructure developments may also contribute to habitat fragmentation, increased human access, and long-term ecological pressure on wildlife habitats.

This dual position reflects the complex role of private sector actors in conservation governance, where economic activities may simultaneously generate both conservation challenges and collaborative opportunities. The collaboration programme includes support for area protection and security, biodiversity conservation, ecosystem restoration, and community empowerment, as well as the provision of facilities and infrastructure for conservation management. Its implementation involves joint patrols conducted with BKSDA South Kalimantan and local community groups, planting food species for the white-fronted langur, collaborative outreach activities with academics and conservation authorities, as well as participation in research activities and scientific seminars related to wildlife conservation.

However, the private sector also faces institutional limitations, particularly a lack of personnel with specialised expertise in conservation. This situation leads to a high dependence on support from academics and government agencies. Case studies show that companies can contribute significantly to conservation through integrated strategies (Aladağ, 2023).

The Role of Academics

Academics and researchers serve as purveyors of scientific knowledge and advocates for evidence-based decision-making (Kurien *et al.*, 2022). In the context of preserving the habitat of the white-fronted langur, researchers from the Faculty of Forestry and the Faculty of Mathematics and Natural Sciences at Lambung Mangkurat University are involved through research, mapping habitats, and providing technical assistance to other stakeholder groups. Informants from academic circles who have long been involved in conservation issues stated that academic support has been achieved through postgraduate research, scientific seminars, and joint outreach activities with governments and businesses.

However, academics also call attention to the long-term threat of increasing community demand for land, which could potentially reduce the habitat and movement corridors of the white-fronted langur. Research shows that academic contributions remain sporadic and dependent on specific projects or funding. The absence of institutional mechanisms linking research findings to policy has resulted in the suboptimal use of scientific knowledge in area management (López-Rodríguez *et al.*, 2017).

The Role of Media

Local media plays a role in disseminating information about the existence of wildlife and conservation issues (Amiraslani & Dragovich, 2021). In this white-fronted langur conservation effort, the local online media outlet “Kabarone” served as a communication platform within

the penta-helix framework. Through its online reporting and platforms, the media contributed to raising public awareness of the importance of habitat preservation.

However, research results indicate that the media’s role as a conservation advocacy tool has not been utilised strategically. Reporting tends to be incidental and not yet integrated into long-term communication strategies. Informants from local online media outlets stated that limited communication infrastructure and access to data and information from stakeholders are major obstacles to providing in-depth and sustainable news. This situation indicates that the media’s role remains at the level of information dissemination and has not yet developed as a systematic actor in driving public opinion and support (Kaul, 2017; Shang *et al.*, 2025).

The findings do not necessarily indicate that local media actors intend to position themselves as formal conservation advocates. Rather, their current role remains primarily informational due to limited institutional capacity, restricted access to data, and the absence of formal collaboration mechanisms with conservation stakeholders. Nevertheless, several informants acknowledged that stronger involvement in environmental communication could become possible if institutional support, communication access, and collaborative platforms were improved.

Dynamics of Interactions between Stakeholders

The research results show that interactions between stakeholders in the conservation of the white-fronted langur habitat in the Teluk Kelumpang Nature Reserve (TKNR) are dynamic, asymmetrical, and influenced by differences in the interests, influence, and capacities of each actor. These interactions do not occur within a singular, established collaborative framework; rather, they arise from a combination of formal cooperation, informal relationships, and underlying tensions among competing interests. The BKSDA South Kalimantan functions as the principal coordinating actor among stakeholders.

The BKSDA South Kalimantan, in particular, plays a central role as a liaison between stakeholders. In practice, cooperation agreements tend to structure and formalise government interactions with the business sector. This collaboration is relatively effective in supporting conservation operations such as area patrols, education, and infrastructure provision. However, this relationship also demonstrates the government's dependence on the business sector for resource support, which under certain circumstances can impact the flexibility of conservation decision-making (Vijaya, 2024).

Interactions between the government and local communities exhibit varying characteristics. While the community has a relatively positive attitude toward white-fronted langur conservation, this relationship has not yet fully developed into an equal partnership. The community still perceives conservation activities as an external agenda that does not always align with its economic needs (Chambwe & Saayman, 2023). Consequently, communication and coordination frequently occur in a situational manner, contingent upon particular project initiatives rather than established collaboration mechanisms (Arifalo, 2024).

Academics usually play a supportive and knowledge-based role in how stakeholders interact with each other. Academics engage extensively with the government and corporate sectors through research, training, and outreach initiatives (Kurien *et al.*, 2022). Nonetheless, academic participation in strategic decision-making is still restricted. The resulting scientific knowledge has not been fully integrated into area management policies, so academic contributions serve more as scientific legitimacy than as a basis for long-term decision-making.

Meanwhile, media interaction with other stakeholders is relatively weak and sporadic. The media often acts as a channel for information dissemination rather than a strategic partner in building a conservation narrative (Kaul, 2017). Limited access to data, information, and communication infrastructure means that

the role of the media has not yet developed into an advocacy actor capable of consistently influencing public opinion (Kaul, 2017).

Using a power–interest matrix to map stakeholders shows that the actors and their roles are not the only things that affect the preservation of the white-fronted langur habitat in the Teluk Kelumpang Nature Reserve. The way power and interests are arranged between actors is the most important thing. The disparity in the levels of influence and interests among stakeholders fosters a functional collaboration pattern; however, it has not yet evolved into an integrative and sustainable collaborative governance framework (Wei *et al.*, 2024).

These findings indicate a governance gap, where key actors dominate the decision-making process, while actors with high stakes, such as local communities, have not been given equal opportunity to participate. The integration of academics and media actors into conservation governance should not be understood solely as the responsibility of government institutions or dominant stakeholders. Effective collaboration requires reciprocal engagement. On the one hand, policy actors need mechanisms to incorporate scientific evidence and public communication into governance processes. On the other hand, academics and media institutions must also actively align their research agendas, communication strategies, and outreach activities with the practical needs of conservation stakeholders. This reciprocal relationship highlights that collaborative governance is fundamentally a two-way process rather than a passive institutional arrangement.

The research findings indicate that the preservation of the white-fronted langur habitat in the Teluk Kelumpang Nature Reserve is intrinsically linked to the dynamics of multi-stakeholder governance. This finding corroborates numerous studies that highlight the necessity of collaboration among stakeholders with diverse interests and varying degrees of influence for effective conservation in fragmented landscapes (Hanum, 2024; Ipara & Kipchumba, 2024). In this context, the penta-

helix approach provides a relevant framework for understanding how the roles of government, society, business, academia, and the media intersect in conservation practices (Hertati *et al.*, 2024; Fadlan *et al.*, 2025). For example, in a study on mangrove management and ecotourism policy in Banyuwangi, East Java, Indonesia, the penta-helix was found to have gaps in the involvement of all elements of government, business, academia, the community, and the media, which resulted in policy implementation that was not fully effective (Sari *et al.*, 2024).

Despite the government's formal mandate to manage the area, research indicates that its role is not fully effective due to limited institutional capacity. Another study on stakeholder collaboration in ecotourism development in Samarinda, East Kalimantan, Indonesia, called for a stronger collaboration model to achieve economic, social, and environmental sustainability goals (Habibi *et al.*, 2025). This condition strengthens the argument that a state-based conservation approach needs to be complemented by collaborative mechanisms that involve non-governmental actors more substantively (Fajrina *et al.*, 2022). Thus,

conservation is not only understood as a regulatory obligation but also as a shared responsibility (Tkaczynski & Rundle-Thiele, 2023).

Stakeholder Mapping Based on Power–Interest Matrix

Further analysis of stakeholder roles and interactions is visualised in Figure 3, a power–interest matrix. This matrix is used to map the relative positions of each level of actor into four quadrants based on their level of power to white-fronted langur habitat conservation and their level of interest in decision-making.

Actors in the top-right quadrant are classified as players because they possess both high power and high interest in conservation governance. Actors in the bottom-right quadrant are categorised as subjects, reflecting strong interest but limited influence. Context setters occupy the top-left quadrant due to their relatively high power but lower operational interest, while actors in the bottom-left quadrant are classified as the crowd because they have limited power and limited direct engagement in conservation decision-making.

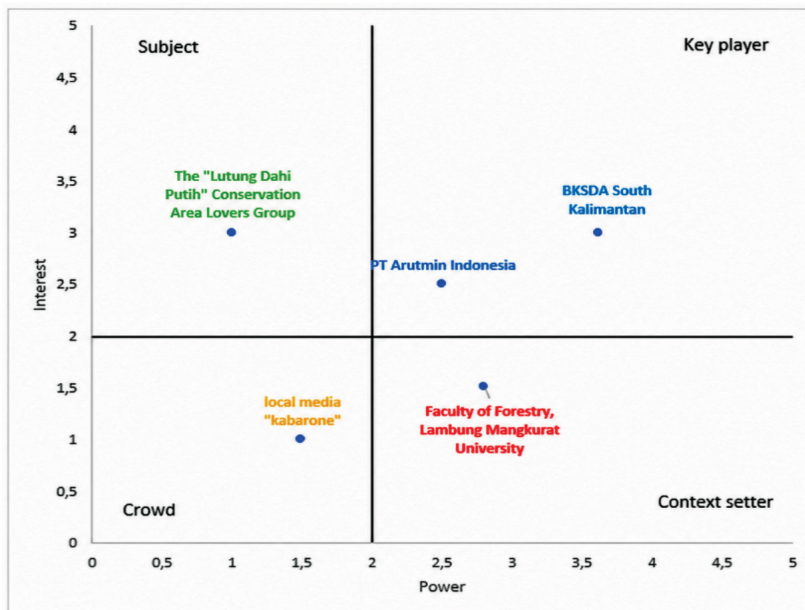


Figure 3: The power–interest matrix of each stakeholder on white-fronted langur conservation

Key Players

The government, represented by the BKSDA South Kalimantan, and businesses operating around the TKNR area are key players. These two actors have significant influence in decision-making and the implementation of conservation activities, as well as a direct stake in the area's sustainability.

The government has formal authority through regulations and area management mandates (Ayunita *et al.*, 2020), while the private sector has control over financial resources, infrastructure, and parts of the landscape that intersect with wildlife (Lamont *et al.*, 2023). The interaction between these two actors forms the main axis of conservation governance at the field level. However, the dominance of these key actors also implies a dependence of the conservation system on commitment and the sustainability of formal collaboration, particularly in the context of limited government resources. This condition reflects the variable and predominantly instrumental nature of private-sector interest in conservation, especially when linked to corporate social responsibility obligations and corporate reputation (Pathania & Rastogi, 2024).

Subjects

Local communities are classified as subjects, namely actors with a high level of interest but relatively low influence in decision-making (Kyriakidis & Anagnostopoulos, 2017). Research findings indicate that the community has concern and a positive attitude towards the existence of the white-fronted langur, as well as a readiness to participate in habitat conservation efforts.

The findings indicate that the current conservation governance system has not yet effectively integrated community participation into formal decision-making processes. This explains why community involvement is largely informal and reactive and heavily dependent on government or business initiatives (Oyewo, 2024). This situation highlights the necessity for an empowerment strategy to elevate society's

role from passive subjects to more influential collaborative actors (Malta, 2023).

Context Setters

Academics and researchers are positioned within the context-setter quadrant. They have a lot of power to shape scientific discourse, knowledge, and legitimacy, but they are less interested in the day-to-day management of the area. Through research, training, and outreach, academics contribute to providing the scientific basis for conservation policy and practice (Gerber & Raik, 2018; Bhushal *et al.*, 2024).

Research findings suggest that the influence of academics is predominantly indirect and contingent upon the degree to which their generated knowledge is embraced by pivotal stakeholders. Academics underutilise their roles in conservation governance due to the absence of formal mechanisms to integrate research findings into policy (Velandar & Donà, 2024). In addition to the absence of formal institutional mechanisms, limited interdisciplinary collaboration, differences in research priorities, funding constraints, and communication gaps between researchers and policymakers contribute to the underutilisation of academic knowledge in conservation governance.

Crowd

The media is classified as a crowd, meaning it has relatively little interest and influence in the conservation decision-making process. Mostly, its role consists of disseminating information and incidentally raising public awareness (Shang *et al.*, 2025).

The position of media actors within the power-interest matrix suggests a potential strategic role in conservation communication and public awareness. However, this potential does not necessarily indicate an institutional intention or priority to engage actively in conservation advocacy, as media involvement remains dependent on organisational interests, communication capacity, and collaborative

incentives. Other literature suggests that the media can elevate public awareness and connect scientific knowledge with political practice or local governance; however, this endeavour requires a clearly articulated communication framework and media involvement in the policy planning stage (Geschke *et al.*, 2023).

Synthesis of Mapping Results

The power–interest matrix reveals an imbalance in power relations in the management of white-fronted langur habitat conservation in the Teluk Kelumpang Nature Reserve. Stakeholders demonstrating high levels of interest often possess limited decision-making authority, and people who have a lot of power sometimes don't care about conservation. This imbalance is why established partnerships tend to be functional and focused on projects, and they haven't yet turned into transformative collaborative governance (Zakaria *et al.*, 2025).

Implications for Strengthening Penta-helix Collaboration

Findings from the power–interest matrix indicate that strengthening white-fronted langur habitat conservation requires different strategies for each stakeholder group. It is important to encourage highly influential actors to make a bigger commitment to conservation (Amel & Manning, 2019). In addition to the absence of formal institutional mechanisms, limited interdisciplinary collaboration, differences in research priorities, funding constraints, and communication gaps between researchers and policymakers also contribute to the underutilisation of academic knowledge in conservation governance. On the other hand, actors who are very interested but not very influential need to have their ability and access to the decision-making process improved (Hedley, 2024).

In this context, the government plays a crucial role as a collaborative facilitator capable of bridging the interests of different actors. Incorporating the business sector's role into long-term conservation strategies, such

as through more formal partnership schemes, can improve the sustainability of conservation efforts (Jones, 2024). On the other hand, more meaningful involvement by the community and academics has the potential to strengthen social legitimacy and the knowledge base for managing the area (Kelly *et al.*, 2019).

Preserving the white-fronted langur habitat is not only related to species protection but also to natural resource governance, social equity, and economic sustainability at the local level. Thus, the penta-helix approach and power-interest matrix analysis provide important contributions in bridging conservation and sustainability issues, particularly in the context of developing countries with high land-use pressures. Comparative studies across conservation areas with different stakeholder characteristics are also important to deepen understanding of the effectiveness of the penta-helix approach in various contexts (Sari *et al.*, 2024). In addition, long-term research is needed to assess the sustainability of multi-stakeholder partnerships and changes in actors' positions within the power–interest matrix framework over time (Bulmer & Prado-Higuera, 2021).

This research contributes to the development of conservation governance studies by demonstrating that the effectiveness of a penta-helix-based collaborative approach is largely determined by the configuration of power relations and interests among stakeholders, not simply by the presence of multiple actors. The integration of the power–interest matrix into penta-helix analysis expands the matrix's function from a mapping tool to an analytical instrument for identifying governance gaps, particularly the marginalisation of actors with high stakes but low influence. Furthermore, this study adds empirical evidence from the context of conservation areas in developing countries, which is still limited in the international literature, and enriches understanding of the instrumental role of the private sector, the limited institutionalisation of academic contributions, and the weak role of the media in collaborative conservation governance.

Conclusion

This research confirms that wildlife habitat conservation in protected areas is a collaborative governance issue determined by the configuration of power relations and interests among stakeholders. While the penta-helix approach provides a conceptual framework for engaging multiple actors, the research findings indicate that the resulting collaboration tends to be functional and not fully integrated. Mapping stakeholders with a power–interest matrix shows that there are gaps in governance, where local communities, despite demonstrating strong conservation interests, continue to possess limited influence over decision-making processes. Conversely, highly influential actors, such as government institutions and the private sector, play a dominant role in determining the direction of area management. Academics and the media, as knowledge- and communication-based actors, enhance scientific legitimacy and public awareness, yet their roles remain inadequately institutionalised. These findings show that successful conservation governance relies not just on having rules and partnerships but also on how well the governance system can handle power imbalances, encourage real participation, and create fair and flexible ways to work together.

Acknowledgements

The researchers would like to express their deepest gratitude to the parties involved in this research, namely the informants, South Kalimantan Natural Resources Conservation Agency (BKSDA Kalsel), the White-fronted Langur Monitoring Team of BKSDA Kalsel, and PT Arutmin Indonesia Site Senakin for their cooperation and support.

Conflict of Interest Statement

The authors agree that this research was conducted in the absence of any self-benefits, commercial, or financial conflicts.

Author Contributions Statement

MA conceptualised the central research idea, provided the theoretical framework and methods, and approved the article's submission. TS contributed to communication with stakeholders and the analysis and interpretation of data about the white-fronted langur and its habitat. SS contributed to the analysis and interpretation of data regarding the role of stakeholders. All authors discussed the results and contributed to the final manuscript.

Data Availability Statement

The research data was supported by information from the BKSDA Kalsel and PT Arutmin Indonesia, particularly data on the white-fronted langur prior to this study.

Ethical Conduct

For research interviews, ethical conduct requires obtaining informed consent, guaranteeing anonymity and confidentiality, ensuring voluntary participation, and respecting the right to withdraw at any point. Animal observation research was conducted using a non-intrusive method, with the help of camera traps.

Declaration of AI-usage

In this project, we used SciSpace for brainstorming ideas and QuillBot to help with grammatical improvements and clarity. The output from these tools was used to provide initial suggestions, but the final content was revised extensively by the authors, who take full responsibility for its accuracy.

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