Forest and Society
Vol. 9(2): 623-640, December 2025
10.24259/fs.v9i2.36879

REGULAR RESEARCH ARTICLE

Community Perspectives on Engaging Stakeholders for Human-Sumatran Tiger Coexistence in the Bukit Barisan Selatan Landscape

Rinekso Soekmadi [1,*], Novriyanti Novriyanti [2,3,5], Burhanuddin Masy'ud [1], Damayanti Buchori [3,4], Christine Wulandari [5], and Ismanto Ismanto [6]

AFFILIATIONS

1. Department of Forest Resources Conservation and Ecotourism, Faculty of Forestry and Environment, IPB University, Bogor, Indonesia
2. Department of Natural Resources and Environment Management, Graduate School of IPB University, IPB University, Bogor, Indonesia
3. Center for Transdisciplinary and Sustainability Sciences, IPB University, Bogor, Indonesia
4. Department of Plant Protection, Faculty of Agriculture, IPB University, Bogor, Indonesia
5. Department of Forestry, Faculty of Agriculture, Universitas Lampung, Indonesia
6. Bukit Barisan Selatan National Park, Lampung, Indonesia

* Corresponding authors:
r.soekmadi@apps.ipb.ac.id

RECEIVED 2024-08-30
ACCEPTED 2025-05-30

ABSTRACT

The Bukit Barisan Selatan (BBS) landscape, a vital habitat for the Sumatran tiger (*Panthera tigris sumatrae*), is increasingly degraded and fragmented by plantation and agricultural expansion, driving tigers into human-dominated areas and creating conflict zones beyond conservation boundaries. However, despite global frameworks like the Kunming-Montreal 2050 Biodiversity Framework and IUCN advocating coexistence by integrating ecological and socio-economic priorities, the practical implementation at the site level remains uncertain, particularly regarding local perspectives on coexistence and their alignment with competing stakeholder interests. This study analyzes the alignment of parties in the context of the potential coexistence of human-tiger conflicts in the landscape based on local community perspectives. The BBS landscape in this study includes Bukit Barisan Selatan National Park (BBSNP), Pesisir Barat Forest Management Unit (KPH Pesisir Barat), and surrounding villages. We employed literature reviews, interviews, and the MACTOR analysis tool in our analysis. Findings reveal that forest managers (BBSNP, FMU Pesisir Barat) and local communities are key stakeholders, with Forest Rangers as crucial links between conservation policy and communities. Effective communication and coordination by rangers and extension officers foster local compliance, but coexistence remains challenging due to frequent human-tiger conflicts in open areas and mixed-tree plantations, including within conservation zones. Divergence of objectives exists between ecological actors prioritizing tiger population enhancement and socio-economic actors prioritizing human security and land access, necessitating a more balanced and holistic approach to ensure long-term sustainability. The study concludes that integrating ecological and socio-economic objectives through stakeholder collaboration, meeting the needs of local communities, and considering their land rights and access in conservation planning is critical to ensure communities are direct beneficiaries and prevent conflicts of interest in sustainable human-tiger conservation efforts.

KEYWORDS

Community-based conservation; Conservation policy; Human-wildlife conflict; Stakeholder prioritization for coexistence; Wildlife conservation governance.

1. INTRODUCTION

The Bukit Barisan Selatan (BBS) landscape is home to the Sumatran tiger (*Panthera tigris sumatrae* Pocock, 1929), a key species and vital entity within the tropical rainforest ecosystem. The national policy designates the conservation and protected forests within the Bukit Barisan landscape, spanning from Aceh to Lampung Province, as primary habitats for this species. Unfortunately, landscape degradation and fragmentation have significantly reduced the quantity, extent, and suitability of wildlife habitats (Gardiner et al., 2019; Scharf et al., 2018; Valente et al., 2023), ultimately

hindering the natural behavior of the Sumatran tiger. This forest-dependent species has begun to venture into areas with high human activity, such as former forests now used for acacia plantations, oil palm estates, rubber, and mixed agriculture (Sunarto et al., 2012). Meanwhile, non-conservation/protected areas, which are not prioritized for wildlife habitat protection, often have inadequate cover and limited food availability for carnivores (Kannan et al., 2021). As tigers cross these boundaries searching for more suitable habitats, negative interactions that can lead to human-wildlife conflict have become increasingly common. Over the years, reports have documented incidents where tigers preyed on livestock and humans, as recently occurred in Lampung, Indonesia (Kurmala et al., 2024), both within and outside the Bukit Barisan Selatan National Park (BBSNP).

Human-wildlife conflict (HWC) is a global issue embedded in the Kunming-Montreal Global Biodiversity Framework (KMGBF) 2050's goal of "Living in Harmony with Nature," particularly within Target 4. In response to this mission, the IUCN established an intergovernmental panel and held the International Conference on Human-Wildlife Conflict and Coexistence in 2023 in Oxford, UK. The IUCN SSC's Good Practice Checklist on human-wildlife conflict and coexistence, launched at this conference, urges countries to manage human-wildlife interactions to minimize conflict and achieve coexistence. At least four of the ten foundational principles emphasize the importance of involving local communities, prioritizing their perspectives, and incorporating traditional ecological knowledge, where available, as part of a win-win solution intertwined with exit strategies to achieve coexistence.

The emergence of coexistence as a solution to HWC is promising for conservation, signaling a shift from traditional conservation methods to more inclusive and innovative approaches (Fiasco & Massarella, 2022). Sustainable coexistence involves more than merely recognizing wildlife in human environments - how the role of animals provides signs for the environment and its changes (Syawal et al., 2023); it requires coordinated actions to manage and mitigate conflict threats (Sillero-Zubiri et al., 2023; Kuswanda et al., 2021). However, various research findings indicate that communities often view wildlife, especially large mammals, negatively, seeing them as threats to livelihoods. Crop damage, destruction of facilities in residential areas (Jaleta & Tekalign, 2024; Matseketsa et al., 2019), livestock predation (Karanth & Kudalkar, 2017), and community fear are the most reported negative interactions, such as in Mexico (Castillo-Huitrón et al., 2024), complicating and challenging future coexistence prospects.

Successful coexistence is crucial to supporting Target 4 of the Kunming-Montreal Global Biodiversity Framework (GBF), recently adopted by Indonesia. Wildlife protection cannot rely solely on officially designated areas such as national parks or state-sanctioned zones. While these areas are critical for conservation, they often fail to address the broader landscape dynamics that affect species like the Sumatran tiger, which requires extensive territory, often extending beyond protected zone boundaries. Stakeholders must collaborate to manage conflicts and prevent them from escalating. The requirements for conservation and resolving HWC span various sectors and necessitate community trust in the government's management of wildlife habitats. Successful examples from India highlight the importance of this trust (Dash et al., 2024).

To address these challenges, this study aims to map local community perspectives on stakeholder involvement and the alignment of efforts in managing human-tiger coexistence within the BBS landscape. By examining the extent of stakeholder participation recognized by local communities, evaluating the influence of different stakeholders from the perspective of those impacted by conflicts, and analyzing the

alignment of stakeholder efforts with the realities of coexistence, this research seeks to contribute to the development of more effective and inclusive conservation strategies based on the lived experiences and needs of local communities.

2. METHOD

2.1 Study location

The study location was determined using a landscape approach because wildlife movement extends beyond specific geographical boundaries and is interconnected with various other aspects, including biophysical, social, political, and psychological factors (Sayer et al., 2007; 2013). The BBS landscape was selected as a representative location for this study because it encompasses various land management types, including state forests such as BBSNP (4 out of 17 resorts/management units) and Pesisir Barat Forest Management Unit (KPH Pesisir Barat) (2 out of 3 resorts/management units), as well as non-state forest areas, including six villages. Geographic information about this study location is presented in Figure 1.

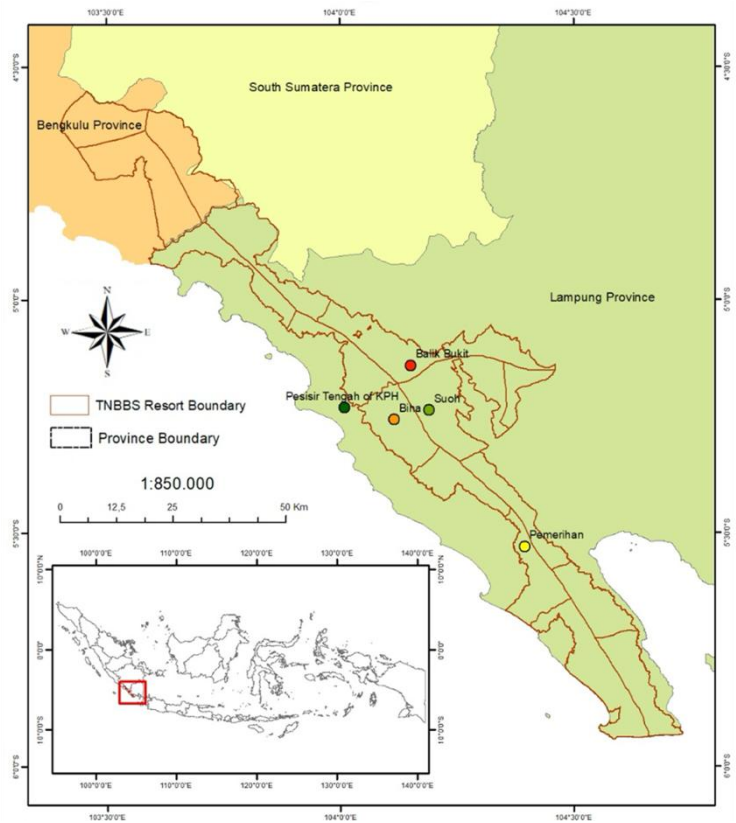

Figure 1. Research Location

2.2 Data collection step 1: Identification of stakeholders and aspects of joint vision for coexistence

Stakeholders were identified based on their activities within the landscape and their links to other aspects of species conservation governance, such as policies, area protection, and biodiversity conservation. This identification was achieved through a

preliminary survey, including initial interviews with representatives of area managers and land users in the BBS landscape to determine which stakeholders are likely to play a role in managing the Sumatran tiger population and addressing conflicts related to this species.

Furthermore, to ensure continued coexistence with wildlife in conflict, stakeholder understanding is essential. Literature shows that interactions between humans and wildlife, particularly carnivorous mammals that often trigger conflict, are typically driven by a gap between socioeconomic conditions (Cummings, 2022) and ecological needs. This study then refers to this understanding as the "Vision for Coexistence." The stakeholder vision for the coexistence plan in the first stage was gathered through a (secondary) literature review, considering the three pillars of sustainability: ecological, social, and economic needs. The results of this secondary formulation were then shared with each other in personal dialogue with each stakeholder in the next stage.

2.3 Data collection step 2: Perspective of local community and other stakeholders on coexistence

After identifying the key stakeholders and formulating a joint vision for future coexistence, this study employed the snowball method to interview 49 informants from local communities residing within the BBS landscape and utilizing multifunctional land in the area. Most informants (90%) were between 40 and 55 years old, while the remaining participants were younger individuals aged 25 to 39. These interviews aimed to gather data on local community perspectives regarding the stakeholders identified in the previous phase and to assess the extent of these stakeholders' involvement with local communities in activities related to wildlife conservation, including outreach, conflict prevention, and conflict resolution. Additionally, these interviews were designed to evaluate the stakeholders' positions concerning the joint vision for achieving future coexistence. The assessment of stakeholder involvement and influence included in the Matrix Direct Influence (MDI) was carried out using a 0-4 scale (positive values), while stakeholder positions concerning the shared objectives or vision for coexistence shown in the Actor Objective Matrix (MAO) were rated using a positive-negative 0-4 scale. The meaning of each scale value is presented in Table 1.

Table 1. Scale Used to Assess Actor Roles and Positions Regarding Other Actors and the Joint Vision (Objective)

Matrix Scale	Meaning of Each Scale Value		
	MDI Value (stakeholder involvement and influence)	Positive (+) MAO Value (vision for coexistence)	Negative (-) MAO Value (vision for coexistence)
0	A particular actor (A) has little to no influence over another actor (B)	The objective has no relationship/influence/impact on the actor	
1	A particular actor (A) is able to influence the management process of another actor (B)	The objective is crucial for supporting the stakeholder's general managerial activities	The objective poses a threat to the stakeholder's general managerial activities
2	A particular actor (A) is able to influence the success of another actor's (B) project	The objective is crucial for the success of ongoing programs/projects	The objective poses a threat to the success of ongoing programs/projects
3	A particular actor (A) is able to influence the mission implementation of another actor (B)	The objective is essential for achieving the stakeholder's main mission	The objective poses a threat to achieving the stakeholder's mission

Matrix Scale	Meaning of Each Scale Value		
	MDI Value (stakeholder involvement and influence)	Positive (+) MAO Value (vision for coexistence)	Negative (-) MAO Value (vision for coexistence)
4	A particular actor (A) is able to influence the existence of another actor (B)	The objective is essential for maintaining the stakeholder's existence	The objective poses a threat to the stakeholder's existence

2.4 Data analysis

Primary interview data were extracted and analyzed using prospective analysis techniques with the MACTOR tool (Matrix of Alliances, Conflicts, Tactics, Objectives, and Recommendations) (Bendahan et al., 2004; Boumaour et al., 2018). Data were entered into actor-actor and actor-objective matrices (Figure 2). Once all entries were completed, MACTOR performed calculations, and the results were displayed in the application window. MACTOR's operational mechanism analyzes actor convergence and divergence regarding management objectives or strategies (Mafruhah et al., 2020; Rees & MacDonell, 2017). This method identifies active and passive actors, alliances, conflicts, strategies, tactics, and project objectives (Boudoukha & Kachef, 2022). It also maps the influence-dependence positions of actors, revealing similarities and differences in their approaches to issues, actions, objectives, and motivations.

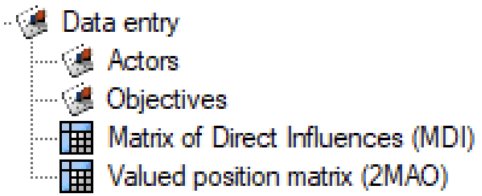

Figure 2. Data Entry Display in the MACTOR Application during the initial Procedure

3. RESULTS

3.1 Conflict occurrence records from several target sites in the BBS landscape

Based on interviews and records from BBSNP managers, it is known that interactions between humans and Sumatran tigers have occurred frequently in the last 10 years. This interaction is characterized by an increase in the intensity of movement of animals entering community plantations or agroforestry sites and settlements from within the forest area. Based on land cover, most conflicts occurred in open areas, mixed plantations, and shrubs, although there were also incidents in areas with forest land cover. Table 2 shows that within the same year, tigers were involved in conflicts in different locations. For example, in 2022, conflicts occurred not only outside the state forest area but also within the forest area of the Forestry Unit (KPH) Pesisir Barat.

Table 2. Situation of the Human-Tiger Interaction Location

Status area	Management unit	Land cover type	Interaction/conflict and occurrence*)
Conservation forest area (BBSNP)	Suoh Resort	Open area/ Mixed-tree plantation, forest	Tiger trapped and died (2019), entered community plantations (2023), attacked and killed humans (2024)
	Pemerihan Resort	Open area/ Mixed-tree plantation	Attacked community livestock (2012 and 2014)

Status area	Management unit	Land cover type	Interaction/conflict and occurrence*)
	Biha Resort	Open area/ Mixed-tree plantation	Attacked community livestock (2015)
	Balik Bukit Resort	Open area/ Mixed-tree plantation	Tiger entered community plantations then attacked livestock (2014 and 2015)
Protected forest area (Forestry Unit (KPH) Pesisir Barat)	Pesisir Tengah Resort	Settlements, Mixed-tree plantation	Attacked livestock (2017, 2023)
	Bengkunat Resort	Mixed-tree plantation	Tiger entered community plantations (2016, 2018, 2022)
		Mixed-tree plantation	Attacked livestock and pets (2024)
Non-forest state area	Suoh and Bumi Hantatai Villages in Lampung Barat Regency	Mixed-tree plantation	Tiger attacked and killed humans (2024)
	Tanjung Raya and Pelita Jaya Villages, Pesisir Barat Regency	Mixed-tree plantation	Tiger entered community plantations (2019, 2023), attacked and killed community livestock (2023)
	Kubu Perahu and Padang Cahaya Villages, Lampung Barat Regency	Mixed-tree plantation, shrub	Animals moved out of the forest area and attacked livestock (2022)

*) Integration of personal field data and records from BBSNP managers

3.2 Stakeholders recognized by local communities in the management of mammal species within the landscape

This study successfully identified 14 stakeholders (Table 3) who are perceived to have mutual influence and dependence on each other. The stakeholders identified with direct activities within the landscape at the site level include the local community itself, Forest Rangers, BBSNP (refers to staff non forest ranger), the Forestry Unit (KPH) of Pesisir Barat (refers to staff, non-forest ranger), local government, local military, and non-governmental organization (WCS-IP). At the provincial and national policy-making levels, stakeholders include the Directorate General of Natural Resources Conservation (Dirjen KSDAE), the Natural Resources Conservation Center (BKSDA), and the Forest Agency of Lampung Province (Dinas Kehutanan). Additionally, stakeholders who operate outside the site but contribute to species conservation governance include universities, the Indonesian National Police, and international conservation organizations such as IUCN and CITES.

Table 3. List of the Stakeholders

No.	Stakeholder/ Institution	Description	Role in the Context of Coexistence
1	Bukit Barisan Selatan National Park	A conservation area in Lampung Province, Indonesia, where human-tiger conflicts frequently occur.	Implementation of biodiversity management policies and techniques within national parks

No.	Stakeholder/ Institution	Description	Role in the Context of Coexistence
2	Local Community	Communities affected by human-tiger conflicts, including those within state forests and private landowners.	Beneficiaries and impacts
3	Directorate General of Natural Resources Conservation (Dirjen KSDAE)	A management unit under the Indonesian Ministry of Environment and Forestry overseeing the Bukit Barisan Selatan NP.	Policy maker in relation to overall conservation
4	Natural Resources Conservation Center Lampung-Bengkulu (BKSDA)	A technical unit under the Directorate General of Natural Resources Conservation, managing biodiversity outside conservation areas.	Implementation of biodiversity management policies and techniques, for all categories of areas, except national parks
5	Indonesian Police	National law enforcement responsible to the President, operating at the district level in Lampung Province.	Ensuring public safety from tiger disturbances
6	Forest Ranger	Civil servants at BBSNP and KPH Pesisir Barat, distinct from the Indonesian police force.	Responsible for safety and order of communities that interact with forest resources
7	IUCN	An international organization dedicated to natural resource conservation.	Create conceptual frameworks and global guidance
8	CITES	An international agreement aimed at protecting wild flora and fauna from international trade.	Create the conceptual framework
9	Forest Agency of Lampung Province (Dinas Kehutanan)	The provincial forestry unit is responsible for managing forest resources, conservation, and watershed management.	Implementation of forest management policies and techniques (holistic) outside conservation areas
10	Forestry Unit (KPH) Pesisir Barat	A technical unit under the Lampung Provincial Forestry Service managing state forests, including production and protection forests.	As a technical implementer of the Forestry Service in certain areas (work areas)
11	Local Government	Village to district-level governments in Lampung Province are involved in managing human-tiger conflicts.	Ensure the safety of the community from tiger disturbances and be responsible for improving the welfare of the tiger
12	University	Higher education institutions in Lampung Province, such as the University of Lampung (UNILA).	Create conceptual frameworks

No.	Stakeholder/ Institution	Description	Role in the Context of Coexistence
13	Local or Global NGO (WCS-IP)	Non-governmental organizations operate programs in the Bukit Barisan Selatan landscape.	As a companion and facilitator of conservation in community and forests/nature
14	Local Military	Indonesian military tasked with maintaining community security at the village and sub-district levels.	Ensuring public safety from tiger disturbances

Of the 14 stakeholders identified, the local community primarily recognizes only the landscape managers (BBSNP and Forestry Unit (KPH) Pesisir Barat) as actively engaged at the site level. These management elements, including national park staff, extension officers, forest rangers, and partner communities of forest rangers (MMP), are acknowledged as key stakeholders in conservation education, biodiversity awareness, and the prevention and resolution of conflicts with Sumatran tigers. The Influence and Dependence Map in Figure 3 highlights four key stakeholders— Forest Rangers, BBSNP (staff), Forestry Unit (KPH) Pesisir Barat (staff), and the local community—as the most influential, with Forest Rangers occupying the most central role.

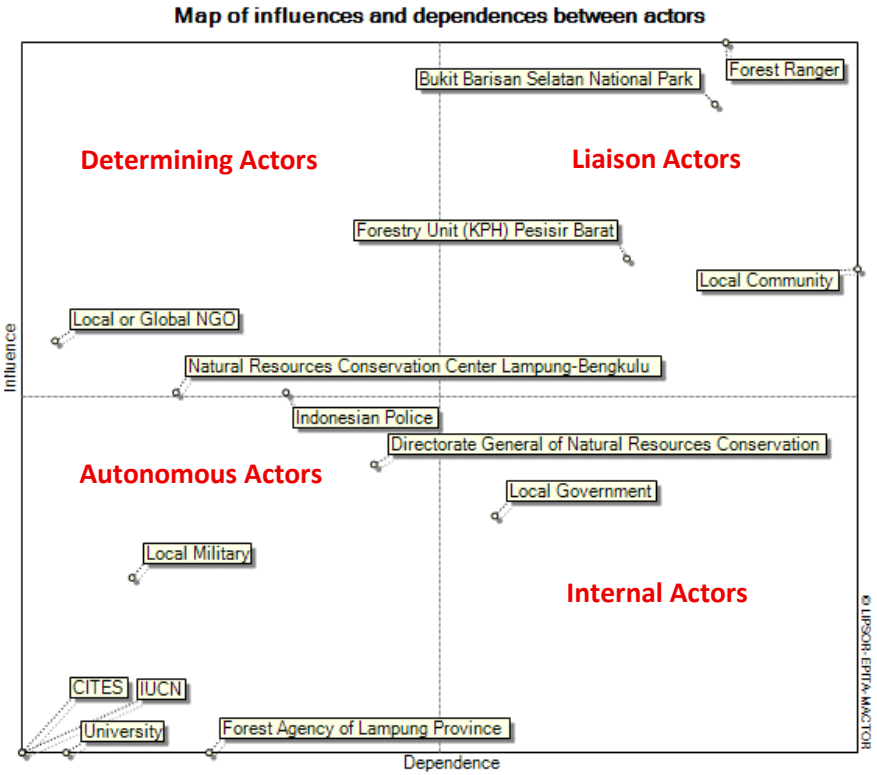

Figure 3. Map of The Level Influence and Dependence among Actors Recognized by Local Communities in Biodiversity Conservation Activities.

In contrast, stakeholders with weaker influence and dependence include international organizations such as IUCN and CITES, which fall into the "Autonomous Actor" quadrant with a value of ZERO. The local community does not recognize the roles and activities of these organizations, which frequently interact with wildlife. While important globally, their local influence is limited and more reliant on field actors. Similarly, national institutions like the Directorate General of Natural Resources Conservation (Dirjen KSDAE) are not a primary concern for the local community. Instead, local government is seen as playing a more dominant role and presence in the field.

3.3 3.3 Approval and Rejection: Coexistence Prospects for Stakeholders (Actor-Objective Engagements)

This study identified eight key Aspects of Joint Vision (objectives) essential for reducing conflict and achieving coexistence based on stakeholder opinions. Two of them are related to social aspects, three to accommodate local economic interests, and the other three are concerned with ecology. This list of objectives is listed in Table 4.

Table 4. List of Objectives in the Resolution of Human-Tiger Interaction Challenges in Lampung Province

No.	Aspects of Joint Vision for Coexistence	Abbreviation	Sustainability Aspect	Description
1	Humans survived tiger existence	PeopleSave	Social	Tigers don't bother humans; humans are safe from tiger presence
2	LC's income safe	Increincom	Economy	Income of stakeholders in landscape management increased/stable/uninterrupted
3	LC's livestock safe	Save_Lvsto	Economy	Tigers do not bother livestock
4	LC's Plantation Yield Safe	Undisturba	Economy	Farm yields of landscape users increase/stable/undisturbed
5	LC's Tenure Security	Fix_Tenure	Social	Security of tenure (sustainable access to land management or utilization of non-timber forest products in conservation and protected areas)
6	Increase tiger population	IncreaPop	Ecology	Increasing tiger population
7	Regular monitoring of tiger movement	Monitorly	Ecology	Tiger populations are regularly monitored jointly by the parties, but programs are developed by the government.
8	Tiger save	Tiger_Save	Ecology	Tiger survived local anger and not killed

MACTOR analysis shows that the local community appraised five of the eight aspect areas prioritized by stakeholders in the initial condition. The five main aspects are: "regular monitoring of tiger population" (Monitorly), "tigers saved from local retaliation" (Tiger_save), "increase tiger population" (IncreaPop), "tigers pose no threat to humans" (PeopleSave), and "tenure security (continued land access)" (Fix_Tenure). These objectives received the highest levels of approval compared to the other objectives (see the 2MAO histogram in Figure 4). However, there is a change in direction in the 3MAO diagram, where stakeholders have made various efforts to balance

ecological and socio-economic aspects. IncreaPop grew significantly, surpassing the support for PeopleSave.

Another interesting highlight is the opposition to the objective (joint vision for coexistence) to three of the five most supported objectives: Monitorly, IncreaPop, and Fix_Tenure. Fix_Tenure faced the highest rejection from the beginning to the end, as depicted in the 3MAO histogram analysis in Figure 4.

The study also explored stakeholder tendencies in supporting specific objectives within the coexistence context. Findings presented in Figure 5 show that Forest Rangers from BBSNP and KPH Pesisir Barat, local or global NGOs working within the landscape, BKSDA, and DirjenKSDAE are stakeholders who support the same coexistence objectives, primarily focused on ecological aspects. Meanwhile, the government and the local community form another group that tends to agree on certain coexistence objectives, mainly related to socio-economic aspects, with moderate strength.

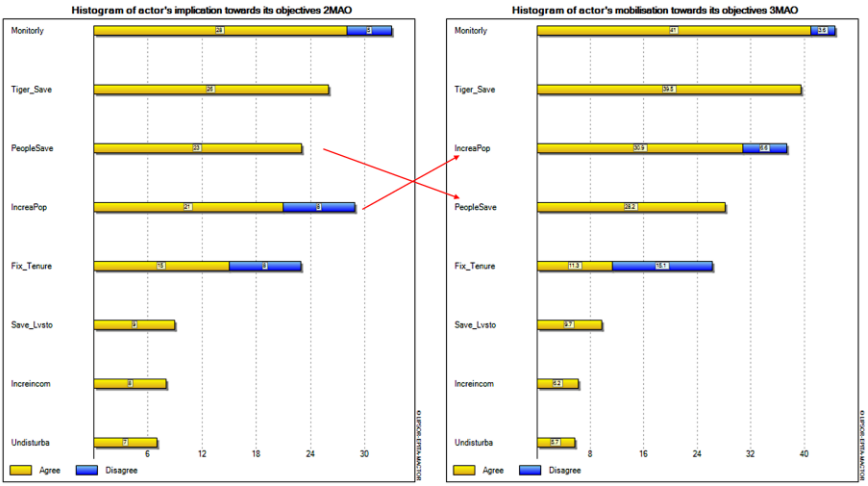

Figure 4. Actor mobility in the context of achieving coexistence goals. 2MAO diagram is the state condition of stakeholders from the perspective of the local community, while 3MAO is the final agreement or support of stakeholders towards the goal of coexistence.

4. DISCUSSION

This study examined efforts to mitigate HWC, particularly those involving the Sumatran tiger, while emphasizing the complexities inherent in such issues. On the one hand, it highlights the potential for coexistence through the lens of local communities directly affected by post-conflict scenarios in Lampung, Indonesia. The urgency and gravity of coexistence in the BBS landscape are underscored, despite the substantial challenges in developing effective strategies. On the other hand, the study reveals the profound impacts of resource control conflicts, which not only jeopardize wildlife survival but also exert significant pressure on human communities.

To address these challenges, the study integrates perspectives from all informants and experts who validated the coexistence agenda presented in Table 4. This agenda aims to minimize conflicts of interest by addressing key priorities: ensuring human safety, securing livelihoods, and fostering tiger population recovery. The vision of coexistence formulated in this study emphasizes the need for a balance between ecological sustainability and socio-economic considerations, which often stand in tension with one another (Braczkowski et al., 2023) Failure to resolve HWCs or

establish coexistence carries dire socio-economic implications for both humans and wildlife, including the potential for deliberate tiger killings. Such scenarios have been observed in countries with tiger populations, including Bangladesh (Inskip et al., 2013), India (Singh et al., 2015), Ghana (Galley & Anthony, 2024), and others.

4.1 Community perspectives, stakeholder roles, and powers: a coexistence challenge

Landscapes, particularly forest ecosystems, serve as nationally and globally critical habitats for predators. However, these areas have increasingly been converted into non-conservation zones without adequately accounting for ecological dimensions. Land-use change emerges as a primary driver of HWC, influenced not only by economic imperatives but also by power dynamics among stakeholders in natural resource governance. In rural communities near forest areas, land is increasingly commodified, detached from its social and relational significance (German, 2022). This commodification generates new arenas of conflict, particularly in areas with open land cover and mixed tree plantations (see Table 2). Such conflicts are especially pronounced in conservation zones, such as the BBSNP and the Forestry Unit (KPH) Pesisir Barat, where competition for resource access is a pivotal issue between humans and wildlife.

Drawing on Ostrom's Common Pool Resources (CPR) theory, conflicts arise from overlapping access to resources shared by human and non-human actors (Nagendra & Ostrom, 2012; Pennington, 2013). The dynamics of land-use change are inherently tied to inequalities in resource management and control, reflecting underlying power relations among various actors (Berbés-Blázquez et al., 2016; Janssen, 2013) Stakeholder engagement in environmental governance is often asymmetrical, heavily influenced by differential resource access and authority.

The state, primarily through the Directorate General of Natural Resources Conservation (Dirjen KSDAE) and relevant ministries, assumes a central role in conservation governance. However, at the local level, communities do not perceive the Director General's involvement as tangible or relevant. Instead, they recognize local state entities such as the BBSNP and KPH Pesisir Barat as primary stakeholders, with the Forest Rangers acting as Liaison Actors (see Figure 3). Liaison Actors play a crucial intermediary role, bridging species conservation policies with the lived realities of communities residing near wildlife habitats.

In addition to state actors, other key stakeholders include local communities and non-governmental organizations, notably the Wildlife Conservation Society (WCS). Local communities serve as the subjects of policy implementation, while WCS, categorized as a Determining Actor, wields significant influence through its funding of conservation initiatives and its direct involvement in managing Sumatran tiger conflicts at the local level. Nevertheless, the roles and authority of these stakeholders—both Liaison and Determining Actors—are fundamentally shaped by the hierarchical power structures established by the state.

The coexistence of humans and wildlife is intricately tied to the authority of the state, which functions as the primary actor in conservation governance, even as it operates autonomously. Local communities often find themselves in a dilemma: while conservation policies aim to protect ecosystems, they frequently limit access to land and resources. Foucault's theory of power relations (Gordon, 1980) highlights how ownership and control over resources function as mechanisms for normalizing social structures, establishing hierarchies, and dictating access. In this context, land management extends beyond its economic value, serving as a tool for social control that shapes power dynamics among stakeholders. Restrictions on forest product usage,

whether for plants or wildlife, reflect broader strategies of power, particularly when framed within conservation objectives.

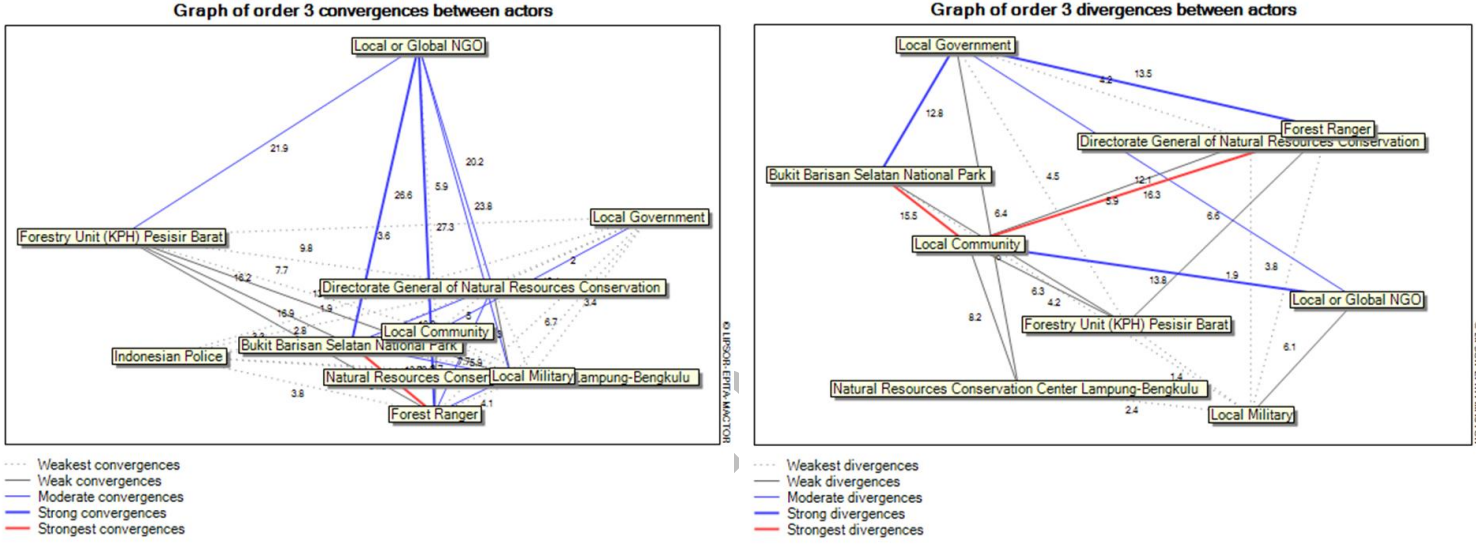

Figure 5. Degree of Agreement and Concurrence (convergence) (A) and conflict or disagreement (divergence) (B) among stakeholders on the prospect of future coexistence goals or plans.

The analysis of the 3MAO actor-objective engagement diagram (see Figure 4) reveals a potential future shift in priorities, complicating efforts to establish coexistence. A noticeable bias toward ecological goals exists, despite local communities emphasizing the importance of human safety as a shared priority. For instance, the goal of "increasing tiger populations" was rated higher than "saving human lives," as evidenced by the 6.6-point score favoring the TigerSave program to prevent population declines (InceaPop). This shift reflects the mandate of national stakeholders, whose primary responsibility is biodiversity protection, reinforced by state authority.

Regional stakeholders, such as the Forest Rangers and conservation area managers (BBSNP and KPH Pesisir Barat) act as instruments of state power and operate under directives from the central government. Their roles are defined by the KSDAE Directorate General Strategic Plan for 2020–2024, which includes conservation and non-forest areas classified as tiger corridors. Non-governmental organizations (NGOs), such as WCS, are pivotal Determining Actors in conservation efforts. These organizations rely on global protocols like IPCC, IPBES, or KMGBF frameworks and align their work with national policies, such as Indonesia's Biodiversity Strategy and Action Plan (IBSAP) 2025–2045. Notably, IBSAP integrates HWC mitigation as part of National Target 4.

The role of local communities in conflict mitigation is critical, as identified in previous research (Ekarini et al., 2022). However, community participation is often not purely voluntary. Access to forest products and land resources in state-managed forest areas remains tightly controlled, reflecting state dominance. For example, communities granted legal access to non-timber forest products through Conservation Partnership schemes, or to small-scale plantations through Social Forestry programs, tend to comply with regional authority policies. This compliance is often driven by the need to maintain legal access and avoid conflict (Bakri et al., 2023). While these partnership programs aim to involve local communities in forest management and have shown effectiveness in reducing conflicts and encouraging voluntary conservation efforts (Hidayat et al., 2024), they simultaneously reinforce state dominance over resource governance.

The prioritization of conservation goals such as TigerSave exemplifies this dynamic. Local communities are acutely aware of the mobilization of state resources—including law enforcement, NGOs, and forestry agencies—for the purpose of tiger conservation. Despite this, communities also acknowledge the importance of balancing wildlife conservation with human safety. Cultural values, such as respect and fear of tigers, remain prevalent, as tigers are often seen as powerful symbols of natural heritage (Dua et al., 2010; Figel et al., 2023; Jaleta & Tekalign, 2024; Malviya et al., 2022). However, many individuals express greater concern over threats to livestock and personal safety, aligning with findings from other studies (Galley & Anthony, 2024; Linkie et al., 2007; Singh et al., 2015).

Achieving ideal coexistence requires integrating ecological values and ethics with social controls facilitated by government initiatives, such as land resource management schemes. However, even with programs like Social Forestry and Conservation Partnerships, conflict risks remain high due to the persistence of tiger habitats in these landscapes. The regions studied have historically been conflict hotspots, with incidents of tiger attacks recurring in 2024 (see Table 2).

Overly rigid, top-down conservation strategies risk exacerbating HWC. As Arts at al. (2023) argues, reducing state dominance and empowering local communities is essential to creating a "convincing link" for sustainable landscape management. Such an approach ensures that social and environmental outcomes are positive, fostering

coexistence that balances biodiversity conservation with human safety and livelihoods.

4.2 A humanistic approach as a driving strategy for coexistence efforts

Human-centric policies are essential when trade-offs arise between human needs and wildlife conservation post-conflict, to prevent escalating tensions. The centralized management system of national parks and the lack of compensation for communities and their agricultural losses caused by wildlife remain significant challenges (Aasoglenang et al., 2024). For local communities, the lands they manage are as vital as the conservation of wildlife and other biodiversity (Velho et al., 2016).

This study accommodates the needs of communities for compensation-related objectives, such as tenure security for managed forest areas (Fix_Tenure). Initially gaining broad approval in the 2MAO histogram, Fix_Tenure experienced significant rejection in the 3MAO histogram. However, ensuring community certainty in managing land and utilizing forest resources within state forest areas is a critical solution for reducing human-tiger conflict escalation and enhancing coexistence potential. Achieving this, however, requires substantial resource allocation and faces numerous challenges, including the complexity of stakeholder coordination.

The study also highlights a promising avenue for coexistence: effective coordination and communication between communities and field officers that emphasize a "humanistic" approach in certain resort areas. In the BBS landscape, communities with legal access to forest areas and forest managers (protected and conservation forests) demonstrate openness to information and mutual respect in ensuring no trade-off between conservation and economic needs. Community compliance in respecting wildlife protection regulations, such as for tigers, reflects their strategy to maintain legal access to forest products and prevent further conflict. This approach offers hope for coexistence planning in the BBS landscape. Such coordination methods help minimize conflict among human landscape users, despite requiring significant initial capacity investments, as noted in previous bioeconomy studies (Ranjan, 2016). Bioeconomy principles have now been integrated into the Government's Long-Term National Development Plan (RPJPN) 2025–2045.

Ultimately, this study underscores the necessity of a nuanced understanding of land cover types and the nature of human-wildlife interactions within specific management units, whether in forest areas (conservation and protected) or other land-use areas. Stakeholders working within particular landscape units must share a collective understanding of conflict mitigation strategies to minimize negative impacts, particularly on community livelihoods (e.g., livestock predation and direct threats to human safety), while maintaining tiger populations. Collaborative efforts among landscape stakeholders, such as expanded initiatives in line with community-based monitoring programs and HWC mitigation teams, can strengthen local engagement. Stakeholders must ensure training of field officers in culturally sensitive communication and conflict resolution, which is essential to building mutual respect and minimizing antagonism. In addition, it is also necessary to establish participatory platforms, such as local conservation councils, that would allow communities to articulate their needs and influence conservation strategies. These platforms should be backed by clear mandates to ensure community input informs national and international policy priorities. Given that negative interactions and even conflicts between humans and tigers are not new, prior analyses (Goodrich, 2010) have emphasized the importance of formulating and implementing detailed plans to reduce such incidents. Expanding initiatives like community-based monitoring programs and HWC mitigation teams, which emphasize humanistic approaches, can strengthen local engagement. Training field officers in culturally sensitive communication and conflict

resolution is essential to build mutual respect and minimize antagonism. In addition, it is also necessary to establish participatory platforms, such as local conservation councils. This would allow communities to articulate their needs and influence conservation strategies. These platforms should be backed by clear mandates to ensure community input informs national and international policy priorities.

5. CONCLUSION

The study successfully mapped local community perspectives on stakeholder engagement, with the main recognition being that direct area stakeholders and other relevant agencies working alongside communities at the site level are instrumental in shaping coexistence strategies. Local community compliance is driven by a combination of legal access and conservation requirements, underscoring the importance of security of tenure (Fix_Tenure) as a key factor in mitigating conflict despite requiring coordination and potentially large resource allocations. To address the stakeholder influence gap, where national conservation strategies often prioritize ecological objectives over socio-economic considerations, explicit policies are needed to implement effective communication and humanist approaches at the site level through various human capacity investments. In addition, revisiting conservation strategies should include inclusiveness of ecological and economic narratives from the community side, recognizing the role of unprotected areas as tiger corridors also needs immediate action. Collaborative governance platforms are needed so that participatory approaches can contribute to sustainable development from a more equitable and effective conservation perspective.

Author Contributions: RS conceived and designed the experiment, then NN as assistant compiled the data analysis mainly with MACTOR; BM wrote the insights after the data; RS as the main author wrote the paper and made the overall discussion together with NN, BM, DB, CW, and II.

Competing Interests: The authors declare no conflict of interest.

Acknowledgments: This research is part of a series of studies on "Institutionalization of Stakeholders in Forest Landscape Governance for the Conservation of Threatened Wildlife Species," focusing on the Sumatran Tiger and Sunda Pangolin; supported by the National Collaborative Research (Ri-Na) with Bukit Barisan Selatan National Park and the University of Lampung. This research is fully supported by IPB under contract number 534/IT3.D10/PT.01.03/P/B/2023. We express our gratitude for this support, both to IPB and to our collaborative research partners.

REFERENCES

Aasoglenang, T. A., Bonye, S. Z., & Nsiah, V. (2024). Where do we go for our livelihoods? Conflicts over access, ownership and control of natural resources in the Mole National Park, Ghana. *GeoJournal, 89*(4), 134. https://doi.org/10.1007/s10708-024-11138-y

Arts, B., Behagel, J., de Koning, J., & van der Zon, M. (2023). Community Forest Management: Weak States or Strong Communities? *Politics and Governance, 11*(2), 336–345. https://doi.org/10.17645/pag.v11i2.6325

Bakri, S., Wulandari, C., Kurniasari, N., Safei, R., Ramdani, D., & Anshory. (2023). Effects of Characteristics and Perceptions of Collectors of Non-Timber Forest Products to be Members of the Partnership Program: A Case Study at Bukit Barisan Selatan National Park, Indonesia. *Jurnal Manajemen Hutan Tropika, 29*(2), 109–118. https://doi.org/10.7226/jtfm.29.2.109

Bendahan, S., Camponovo, G., & Pigneur, Y. (2004). Multi-issue actor analysis: Tools and models for assessing technology environments. *Journal of Decision Systems, 13*(2), 223–253. https://doi.org/10.3166/jds.13.223-253

Berbés-Blázquez, M., González, J. A., & Pascual, U. (2016). Towards an ecosystem services approach that addresses social power relations. *Current Opinion in Environmental Sustainability, 19,* 134–143. https://doi.org/10.1016/j.cosust.2016.02.003

Boudoukha, A., & Kachef, S. (2022). Actors' Strategy in Urban Project using MACTOR Tool: Case of Setif Tramway, Algeria. *International Journal of Innovative Studies in Sociology and Humanities, 7*(11), 162–178. https://doi.org/10.20431/2456-4931.071115

Boumaour, A., Grimes, S., Brigand, L., & Larid, M. (2018). Integration process and stakeholders' interactions analysis around a protection project: Case of the National park of Gouraya, Algeria (South-western Mediterranean). *Ocean and Coastal Management, 153,* 215–230. https://doi.org/10.1016/j.ocecoaman.2017.12.031

Braczkowski, A. R., O'Bryan, C. J., Lessmann, C., Rondinini, C., Crysell, A. P., Gilbert, S., ... & Biggs, D. (2023). The unequal burden of human-wildlife conflict. *Communications Biology*, *6*(1), 1–9. https://doi.org/10.1038/s42003-023-04493-y

Castillo-Huitrón, N. M., Naranjo, E. J., Enríquez, P., Santos-Fita, D., Estrada-Lugo, E., & González-García, J. M. (2024). Feelings, conflicts, and use: wildlife-human interactions in El Triunfo Biosphere Reserve, Mexico. *Human Dimensions of Wildlife, 29*(4), 416–431. https://doi.org/10.1080/10871209.2023.2263471

Cummings, A. R. (2022). An exploratory analysis of stakeholders and their influence on human–Jaguar conflict in Guyana. *Human Dimensions of Wildlife, 27*(6), 571–579. https://doi.org/10.1080/10871209.2021.1967524

Dash, S. K., Ghosh, S., Das, R., Das, D., Nandy, S., Das, T., & Sonker, G. (2025). Human-elephant conflict: attitudes of local people toward elephants and the conflict management authority in a shared landscape of India. *Human Dimensions of Wildlife*, *30*(3), 304-319. https://doi.org/10.1080/10871209.2024.2372106

Dua, H. S., Dua, A. S., & Singh, A. D. (2010). The eye of the tiger. *British Journal of Ophthalmology, 94*(2), 166. https://doi.org/10.1136/bjo.2009.178251

Ekarini, D. F., Setiawati, S., & Gawi, J. M. (2022). Enabling sustainable community-based human-tiger conflict management in Seluma, Bengkulu, Indonesia. *Biodiversitas, 23*(12), 6404–6412. https://doi.org/10.13057/biodiv/d231238

Fiasco, V., & Massarella, K. (2022). Human-Wildlife Coexistence: Business as Usual Conservation or an Opportunity for Transformative Change? *Conservation and Society, 20*(2), 167–178. https://doi.org/10.4103/cs.cs_26_21

Figel, J. J., Safriansyah, R., Baabud, S. F., & Herman, Z. (2023). Clustered conflicts in disturbed lowlands characterize human–tiger interactions in Aceh, Indonesia. *Wildlife Letters, 1*(2), 83–91. https://doi.org/10.1002/wll2.12016

Galley, W., & Anthony, B. P. (2024). Beyond Crop-Raiding: Unravelling the Broader Impacts of Human-Wildlife Conflict on Rural Communities. *Environmental Management, 74*, 590–608. https://doi.org/10.1007/s00267-024-02018-9

Gardiner, R., Hamer, R., Leos-Barajas, V., Peñaherrera-Palma, C., Jones, M. E., & Johnson, C. (2019). State-space modeling reveals habitat perception of a small terrestrial mammal in a fragmented landscape. *Ecology and Evolution, 9*(17), 9804–9814. https://doi.org/10.1002/ece3.5519

German, L. A. (2022). *Power/Knowledge/Land: Contested Ontologies of Land and Its Governance in Africa*. University of Michigan Press. https://doi.org/10.3998/mpu

b.12071412
Goodrich, J. M. (2010). Human-tiger conflict: A review and call for comprehensive plans. *Integrative Zoology, 5*(4), 300–312. https://doi.org/10.1111/j.1749-4877.2010.00218.x
Gordon, C. (1980). *Power/Knowledge: Selected Interviews and Other Writings 1972-1977 Michel Foucault.* Pantheon Books. https://doi.org/10.2307/jj.3079041.7
Hidayat, H., Acciaioli, G., Jafar, T. B., Rachmawan, D., Sianipar, C. P. M., Sundary, L. V., ... & Utomo, M. B. (2024). Evaluating a forestry partnership between a private company and local people in East Kalimantan, Indonesia: a political ecology approach. *International Forestry Review*, *26*(2), 212-223. https://doi.org/10.1505/146554824838819923
Inskip, C., Ridout, M., Fahad, Z., Tully, R., Barlow, A., Barlow, C. G., Islam, M. A., Roberts, T., & MacMillan, D. (2013). Human-Tiger Conflict in Context: Risks to Lives and Livelihoods in the Bangladesh Sundarbans. *Human Ecology, 41*(2), 169–186. https://doi.org/10.1007/s10745-012-9556-6
Jaleta, M., & Tekalign, W. (2025). Human-wild mammal interaction and the local people's attitudes towards the mammals in Gara Bilita (Belete Gera) forest, South-West Ethiopia. *Human Dimensions of Wildlife*, *30*(3), 362-369. https://doi.org/10.1080/10871209.2024.2372098
Janssen, M. A. (2013). Governance of Common-Pool Resources. In Shogren, J. F. (Ed.), *Encyclopedia of Energy, Natural Resource, and Environmental Economics (1st Edition)* (pp. 38-44). Elsevier. https://doi.org/10.1016/B978-0-12-375067-9.00105-4
Kannan, P., Salaria, S., Khan, S., Mark, T., Baberwal, N., Bhatnagar, A., ... & Chanchani, P. (2022). Assessing carnivore occurrence and community attitudes towards wildlife in a multi-use arid landscape corridor. *Frontiers in Conservation Science*, *2*, 787431. https://doi.org/10.3389/fcosc.2021.787431
Karanth, K. K., & Kudalkar, S. (2017). History, Location, and Species Matter: Insights for Human–Wildlife Conflict Mitigation From India. *Human Dimensions of Wildlife, 22*(4), 331–346. https://doi.org/10.1080/10871209.2017.1334106
Kurmala, A., G, R., & Nasution, R. (2024). *West Lampung resident survives Sumatran tiger's attack: Police.* Antaranews.Com. Accessed from https://en.antaranews.com/news/308196/west-lampung-resident-survives-sumatran-tigers-attack-police
Kuswanda, W., Harahap, R. H., Alikodra, H. S., & Sibarani, R. (2021). Characteristics of the Tapanuli Orangutan Habitat in the Conflict Area of Batang Toru Landscape, North Sumatra, Indonesia. *Forest and Society*, *5*(1), 90–108. https://doi.org/10.24259/fs.v5i1.11155
Linkie, M., Dinata, Y., Nofrianto, A., & Leader-Williams, N. (2007). Patterns and perceptions of wildlife crop raiding in and around Kerinci Seblat National Park, Sumatra. *Animal Conservation, 10,* 127–135. https://doi.org/10.1111/j.1469-1795.2006.00083.x
Mafruhah, I., Supriyono, S., Mulyani, N. S., & Istiqomah, N. (2020). Causality between tourism industry development and the ecological sustainability in marine environment: A convergence and divergence among stakeholder with mactor analysis. *International Journal of Energy Economics and Policy*, *10*(4), 85-92.
Malviya, M., Kalyanasundaram, S., & Krishnamurthy, R. (2022). Paradox of success-mediated conflicts: analysing attitudes of local communities towards successfully reintroduced tigers in India. *Frontiers in Conservation Science*, *2*, 783467. https://doi.org/10.3389/fcosc.2021.783467
Matseketsa, G., Muboko, N., Gandiwa, E., Kombora, D. M., & Chibememe, G. (2019). An

assessment of human-wildlife conflicts in local communities bordering the western part of Save Valley Conservancy, Zimbabwe. *Global Ecology and Conservation, 20*, e00737. https://doi.org/10.1016/j.gecco.2019.e00737

Nagendra, H., & Ostrom, E. (2012). Polycentric governance of multifunctional forested landscapes. *International Journal of the Commons, 6*(2), 104–133. https://doi.org/10.18352/ijc.321

Pennington, M. (2013). Elinor Ostrom and the robust political economy of common-pool resources. *Journal of Institutional Economics, 9*(4), 449–468. https://doi.org/10.1017/S1744137413000258

Ranjan, R. (2016). Exploring Inter-Relationships among Human-Tiger Conflicts, Human Capital Outcomes for Forest Dependent Communities and the Sustainability of Tiger Habitats. *Human Ecology, 44*(5), 617–631. https://doi.org/10.1007/s10745-016-9854-5

Rees, G. H., & MacDonell, S. (2017). Data gathering for actor analyses: A research note on the collection and aggregation of individual respondent data for MACTOR. *Future Studies Research Journal: Trends and Strategies, 9*(1), 115–137. https://doi.org/10.24023/futurejournal/2175-5825/2017.v9i1.256

Sayer, J., Campbell, B., Petheram, L., Aldrich, M., Perez, M. R., Endamana, D., ... & Burgess, N. (2007). Assessing environment and development outcomes in conservation landscapes. *Biodiversity and Conservation*, *16*(9), 2677-2694. https://doi.org/10.1007/s10531-006-9079-9

Sayer, J., Sunderland, T., Ghazoul, J., Pfund, J. L., Sheil, D., Meijaard, E., ... & Buck, L. E. (2013). Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses. *Proceedings of the national academy of sciences*, *110*(21), 8349-8356. https://doi.org/https://doi.org/10.10 73/pnas.1210595110

Scharf, A. K., Belant, J. L., Beyer, D. E., Wikelski, M., & Safi, K. (2018). Habitat suitability does not capture the essence of animal-defined corridors. *Movement Ecology, 6*(1), 1–12. https://doi.org/10.1186/s40462-018-0136-2

Sillero-Zubiri, C., Caruso, F., Chen, Y., Christidi, D., Eshete, G., Sanjeewani, N., ... & Pierre, M. A. (2023). From conflict to coexistence: the challenges of the expanding human–wildlife interface. *Oryx*, *57*(4), 409-410. https://doi.org/10.1017/S0030605323000698

Singh, R., Nigam, P., Qureshi, Q., Sankar, K., Krausman, P. R., Goyal, S. P., & Nicholoson, K. L. (2015). Characterizing human–tiger conflict in and around Ranthambhore Tiger Reserve, western India. *European Journal of Wildlife Research, 61*(2), 255–261. https://doi.org/10.1007/s10344-014-0895-z

Sunarto, S., Kelly, M. J., Parakkasi, K., Klenzendorf, S., Septayuda, E., & Kurniawan, H. (2012). Tigers need cover: Multi-scale occupancy study of the big cat in Sumatran forest and plantation landscapes. *PLoS ONE, 7*(1). https://doi.org/10.1371/journal.pone.0030859

Syawal, A., Pudyatmoko, S., Faida, L. R. W., Sirami, E. V., Setyadi, E. G., Puradyatmika, P., Suwandi, R.E., & Imron, M. A. (2023). Ethno-conservation of New Guinea Singing Dog among Tribes in Pegunungan Tengah, Papua, Indonesia. *Forest and Society*, *7*(1), 135–149. https://doi.org/10.24259/fs.v7i1.24022

Valente, J. J., Rivers, J. W., Yang, Z., Nelson, S. K., Northrup, J. M., Roby, D. D., ... & Betts, M. G. (2023). Fragmentation effects on an endangered species across a gradient from the interior to edge of its range. *Conservation Biology*, *37*(5), e14091. https://doi.org/10.1111/cobi.14091

Velho, N., Srinivasan, U., Singh, P., & Laurance, W. F. (2016). Large mammal use of protected and community-managed lands in a biodiversity hotspot. *Animal Conservation, 19*(2), 199–208. https://doi.org/10.1111/acv.12234