# Survey and field interview analysis regarding the rejection by the Balai Adat Manggajaya community of the agreement on administrative boundaries between Hulu Sungai Tengah Regency and Kotabaru Regency

Sa'dianoor[1 7*], Samsul R.[2], Gusti R. E.[3], Yajid F. A.S.[4], Madalia I.[5], Deden R.P.[6], Andi A.P.[7], and Syamsul M.[8]

[1]Government Officer, Department of Public Housing and Settlement Areas, Hulu Sungai Tengah Regency Government, Indonesia. sadianoor@umbjm.ac.id

[2]Regent, Government of Hulu Sungai Tengah Regency, Indonesia. samsulrizal@hstkab.go.id

[3]Vice Regent, Government of Hulu Sungai Tengah Regency, Indonesia. gustirosyadielmi@hstkab.go.id

[4]Chairman of Commission I, Regional House of Representatives of Hulu Sungai Tengah Regency, Indonesia. yajidfahmi880@gmail.com

[5]Government Officer, Department of Public Housing and Settlement Areas, Hulu Sungai Tengah Regency Government, Indonesia. madaliaindrasari26@gmail.com

[6]Government Officer, Department of Public Housing and Settlement Areas, Hulu Sungai Tengah Regency Government, Indonesia. deden.rahmat2005@gmail.com

[7]Lecturer, Study Program of Urban and Regional Planning, Faculty of Engineering, Universitas Muhammadiyah Banjarmasin, Indonesia. andiachmadp@umbjm.ac.id

[8]Professor, Doctoral Program, Indonesia Defense University, Indonesia. maarif.syamsul73@gmail.com

***Abstract*** *This study investigates the reasons behind the rejection by the Balai Adat Manggajaya community of the administrative boundary agreement between Hulu Sungai Tengah Regency and Kotabaru Regency, signed in 2021. The research addresses issues caused by boundary delineation that did not integrate terrestrial and photogrammetric approaches, resulting in inaccurate administrative lines. Such inaccuracies have disrupted the indigenous land rights of the Manggajaya community, highlighting the conflict between these administrative decisions and the goals of sustainable development, which should be sensitive to local geographic and community contexts. The study utilizes a mixed-method approach, incorporating field surveys and direct interviews, supported by spatial analysis to assess the delineation accuracy. The results reveal significant discrepancies between the agreed boundary and the local indigenous land claims, underlining the necessity for boundary policies that are adaptive and inclusive of social and spatial realities. These findings emphasize the importance of participatory approaches in boundary-setting and contribute to a better understanding of socio-spatial dynamics in administrative boundary decisions.*

*Keywords : Boundary disputes, Indigenous Land rights, Survey, Spatial analysis, Participatory planning*

**Introduction**

The Meratus Mountains area in South Kalimantan is the main domicile for indigenous communities such as the Meratus Dayak, who have, for generations, protected and managed natural resources based on a social kinship system and traditional governance through customary councils. The rights of indigenous communities over land and resources have been formally recognized in national regulations, from the Basic Agrarian Law to the latest rules on social justice and protection of indigenous communities, although implementation in the field often encounters various obstacles (Permadi et al., 2025).

Historically, the land management pattern of the Meratus Dayak is based on rotational inheritance of land and local customary norms, a system that has proven to preserve ecological sustainability and serves as the main buffer for water resources and biodiversity in South Kalimantan (Herman et al., 2021). Geospatial studies and literature also confirm that the social and cultural identity of local communities is closely intertwined with the Meratus Mountains ecosystem, shaping the spatial pattern and territorial character of the southern region of Kalimantan (Gorsel, 2018).

On the other hand, access to education, infrastructure, and public services in remote villages such as Manggajaya is greatly affected by administrative decisions that are often made without full participation of local residents. The state's obligation to ensure equitable education under the 1945 Constitution and the achievement of Sustainable Development Goals (SDGs) emphasizes that indigenous and remote communities should not be marginalized in spatial policy and development planning. The universal right to education for every citizen is also in line with Sustainable Development Goal (SDG) number 4, namely ensuring quality, inclusive, and equitable education for all.

The formal legalization of the administrative boundary agreement between Hulu Sungai Tengah Regency and Kotabaru Regency in recent years has become a crucial turning point for the emergence of local tensions. The determination process, which was conducted "at the table" and based solely on documents, often neglects the real social, cultural, and ecological conditions on the ground. For the Dayak community, boundary determination is not merely a legal issue but also pertains to tradition, collective identity, and the principle of communal ownership. Disregarding these perspectives has the potential to trigger social conflict and rejection from indigenous communities, as happened in Balai Manggajaya and Balai Juhu (Lolita et al., 2023).

The urgency of this research lies in the fact that boundary determination and resolution are not merely technical mapping processes, but multidimensional issues that require the involvement of indigenous leaders and substantial recognition of traditional claims. Neglecting these aspects can disrupt livelihoods, access to basic services, and even long-term social-environmental security (Sakinah & Surtikanti, 2024). Recent literature emphasizes the importance of participatory, adaptive, and inclusive approaches based on terrestrial surveys and geospatial technologies as prerequisites for achieving fair and sustainable boundary delineation outcomes.

This study seeks to strengthen the discourse on boundary determination by integrating field surveys, direct interviews, and comprehensive spatial data analysis to test the accuracy and legitimacy of regional boundary decisions. The findings are expected to enrich understanding of the socio-spatial dynamics of administrative boundary conflicts and provide policy recommendations grounded in social justice and spatial accuracy.

The main issue in this research is the discrepancy between the administrative boundary delineation agreed upon by the government and the traditional claims and rights of the indigenous community in Balai Manggajaya. The boundary determination process, which relied solely on administrative approaches without integrating field surveys, spatial analysis, and active participation of indigenous communities, has led to conflicts over customary land rights, social exclusion, and threats to the community's long-term sustainability.

To date, there has been no model or mechanism that successfully integrates terrestrial survey methods and spatial data with the principles of local community participation in boundary-setting practices. As a result, decisions tend to overlook the unique socio-cultural realities and territorial characteristics, thereby potentially increasing tensions, creating enduring disputes, and weakening the legal protection for traditional community rights in the border areas of Hulu Sungai Tengah and Kotabaru Regencies.

The objectives of this research are :

1. To identify differences between the results of administrative boundary delineation and indigenous community claims;
2. To analyze the causes of rejection of the boundary agreement;
3. To formulate a spatial, social, and participatory-based boundary determination model recommendation.

**Literature Review**

Administrative boundary conflicts in the Meratus Mountains are often caused by the process of boundary setting that ignores the customary land rights of indigenous communities. Research by Lolita et al. (2023) shows that government decisions are sometimes made without traditional deliberation, prompting active rejection by the customary councils. Land is viewed not only as a legal object, but as a representation of identity and a source of livelihood for the Dayak Meratus community. The gap in interpretation of boundaries between state administration and local claims often becomes a source of dispute.

Research by Herman et al. (2021) highlights the role of customary norms and inherited land rotation in maintaining the ecosystem and social justice in the Dayak Meratus region. Social identity and spatial arrangement are formed through interactions of hereditary tradition. Boundary conflict has a direct impact on declining quality of life and access to resources. Understanding the community's collective values is crucial for building fair boundary agreements.

National regulations, including the Basic Agrarian Law, have provided protection for indigenous community rights in Indonesia. Nevertheless, implementation in the field still faces bureaucratic challenges and overlapping political interests. Permadi et al. (2025) revealed the need for substantial participation and recognition of indigenous rights. The inability of the formal system to accommodate local wisdom leads to exclusion and increases the potential for territorial conflict.

Sakinah & Surtikanti (2024) highlighted that the establishment of territorial boundaries must be oriented toward dialogue between state law and customary law. Negotiation of these two legal systems is important to achieve justice and maintain territorial integrity. Traditional rights must not only be recognized in official state documents, but also practiced in boundary affirmation. Failure of dialogue will deepen mistrust and hamper regional development.

Geospatial technology is increasingly playing a strategic role in boundary demarcation, both through digital data acquisition and validation. The use of GPS in field surveys has produced accurate coordinates at conflict points. Satellite imagery such as Google Maps and SPOT can strengthen the results of superimposing official regional maps and local data. Digital spatial data processing helps speed up the verification and reconciliation of claims. GPS navigation results from field surveys at boundary conflict points are combined with multi-source satellite imagery and administrative maps to achieve more accurate and verifiable delineation. (El-Rabbany, 2002; Teeuw et al., 2013; Theilen-Willige, 2018).

The use of Digital Elevation Models (DEMs) from BIG and SRTM has become a mainstay for topographic analysis in disputed areas. This technology allows for the identification of contours, river flow fields, and conflict-prone zones. The combination of elevation data assists in infrastructure planning, such as roads and bridges. Thus, evidence-based spatial delineation is increasingly gaining legitimacy in both administrative and local community domains.

Remote sensing research is able to monitor changes in land cover and the impacts of extractive activities in the Dayak Meratus customary territory. Su et al. (2015) demonstrated that integrating imagery with GPS and DEM can predict the flow of polluted water. Digital spatial data are processed to identify areas affected by gold mining and environmental changes. The results of the analysis provide input for spatial planning and ecosystem restoration policy.

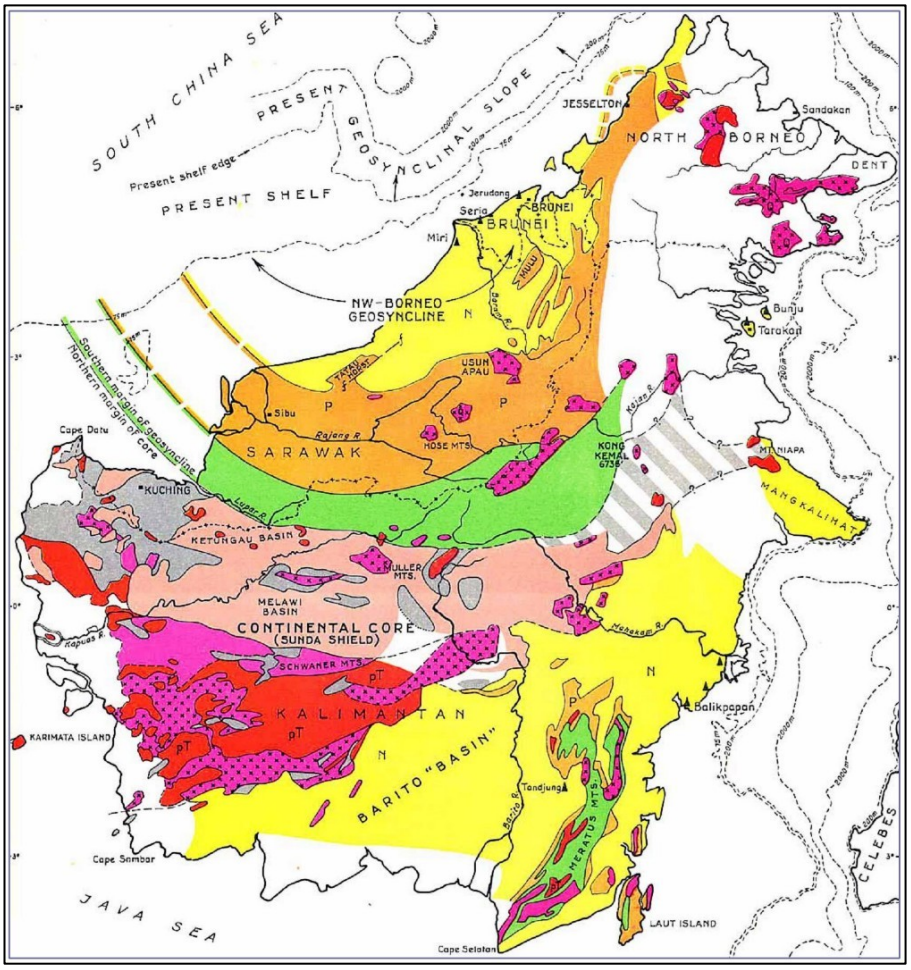
Teeuw et al. (2013) Underscores the importance of high-resolution satellite imagery for participatory land claim validation. The process of overlaying field survey data and digital imagery prevents the monopoly of boundary interpretation by any one party. Technology supports deliberations with transparent visual data. This approach strengthens the position of indigenous communities in negotiating territorial legality. Literature documentation such as Gorsel (2018) and Fajari (2017) affirms the role of traditional spatial planning and ecology as the basis for territorial mapping. The attachment of the Dayak Meratus to the Meratus Mountains shapes cultural identity and local economic patterns. Geospatial studies are increasingly acknowledged as academic instruments and advocacy tools for customary land rights. Collaboration between research and local communities has produced interactive maps of customary territories that are ecologically and socially valid. Overall, the integration of field surveys, remote sensing technology, and customary law narratives is key to resolving boundary disputes in South Kalimantan.

## Methodology

### Study Area

This research was conducted in the Meratus Mountains area located in Hulu Sungai Tengah Regency, South Kalimantan Province. Hulu Sungai Tengah Regency borders Balangan Regency to the north, Kotabaru Regency to the east, Hulu Sungai Selatan Regency to the south, and Hulu Sungai Utara Regency to the west. Geographically, the regency is situated at approximately 2°27'–2°46' South Latitude and 115°05'–115°31' East Longitude, with a total area of about 1,770.77 km².

The Meratus Mountains are approximately 472.1 km long and about 100 km wide. This region stretches across the northern zone, which includes Tabalong, Hulu Sungai Tengah, Hulu Sungai Selatan, and Tapin Regencies; the southeastern zone in Tanah Bumbu and Kotabaru Regencies; and the southwestern zone in Banjar Regency. The environment of the Meratus Mountains and the Barito River Basin provides abundant biodiversity, establishing it as a cultural region inhabited by humans (Fajari, 2017).




*Source: Gorsel (2018)*

Figure 1: Geologic provinces and basins of Borneo.

The map shown in Figure 1 presents the position of the Meratus Mountains in southeastern Kalimantan as a major structural belt comprised of ultramafic rocks, ophiolite, as well as metamorphic and magmatic rocks dating from the Jurassic to the Tertiary periods. Geological literature, such as BIG IV Borneo and various studies, indicate that Meratus is the result of subduction and obduction processes, an ancient oceanic arc remnant now uplifted to the surface. This Meratus zone plays an important role in regional tectonic evolution and is rich in minerals such as gold and chromite. Thus, the figure and reference

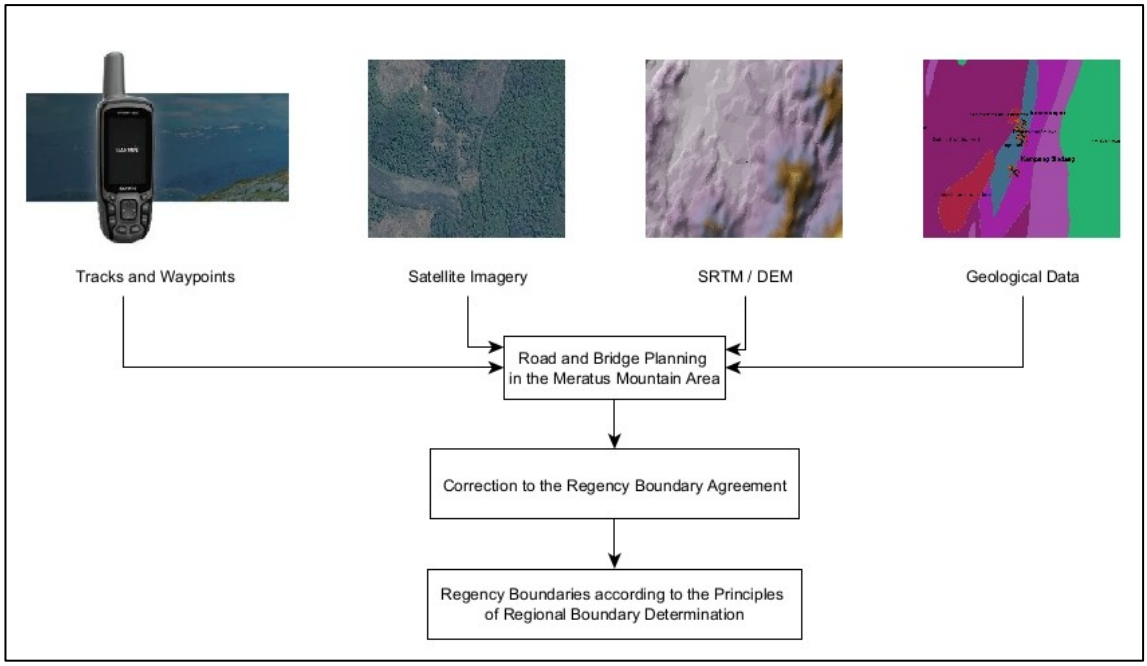
sources provide visualization and confirmation of the strategic role of the Meratus Mountains in the geological history and natural resources of Kalimantan.

The focus area of this research is the route used by people traveling from Balai Adat Datar Tarap to Balai Adat Manggajaya. This is a traditional path that has been used for generations for mutual visits. According to information from the subdistrict and village heads, RT 03 Manggajaya has a population of 60 people (17 households), with 29 males and 31 females, and 8 school-age children. These residents experience difficulty getting to their main village school due to the lack of adequate roads and a pedestrian bridge.

**Research Design**

The research design follows the principles of mixed methods as emphasized by Setiawan et al. (2023), combining quantitative data processing and in-depth exploration of field qualitative data, to obtain a comprehensive picture of boundary conflict dynamics and the legitimacy of customary land rights. This study integrates quantitative survey results (GPS, coordinate acquisition), qualitative interviews (ethnographic and customary narrative), and spatial analysis based on geospatial data (overlay, imagery, DEM). This combination aims to produce a comprehensive overview of the spatial, legal-administrative, and socio-cultural phenomena of boundary conflict. Field data are combined with official documents and imagery for spatial validation, while in-depth interviews capture the perspectives and claims of indigenous communities.

The spatial analysis stage includes the superimposition process of GPS data with satellite imagery and administrative maps, which allows differences in boundary claims to be visualized in detail (Figure 3). The overlay technique is used to compare the results of official delineation and indigenous community claims, supported by DEM analysis as well as the synchronization of imagery and GPS. Ethnographic interviews and local narrative exploration are conducted to map social dynamics, culture, and community participation in the boundary determination process. The combination of survey techniques, spatial analysis, and participatory approaches produces robust empirical data to underpin the integration of a spatial, social, and participative boundary determination model.




*Source: Processed by the researcher in 2025*

Figure 3: Research Framework

**Data Sources**

Primary data includes field surveys for boundary coordinate acquisition, observation of geographic and social conditions, and interviews with indigenous communities, balai leaders, and local officials. Secondary data includes high-resolution satellite imagery (USGS, SPOT, Google Maps), digital elevation model data (DEM/SRTM, DEMNAS from BIG), administrative maps, geological data (.shp from the Center for Geological Research and Development), literature references, and policy documents. The spatial data processed in GIS for this research is obtained from digital maps, satellite imagery, GPS measurements, Webgeoportal, and remote sensing. The data model consists of vector and raster formats, supporting the combination of spatial analysis via overlay and further processing using both open source and commercial software (Okma Yendri et al., 2024).

**Sampling and Site Selection**

The selection of survey and interview locations focused on boundary conflict points (Balai Manggajaya and the intersection area between agreed and customary boundaries), representative customary halls, and infrastructure that served as study objects. The sampling technique was purposive, selected in a stratified manner to ensure coverage of spatial and social variability, while also considering representation of the main access routes and residents' economic zones.

**Data Collection Methods**

**Interviews.** Interviews were conducted by visiting Balai Adat Batu Perahu, Balai Adat Juhu, Balai Adat Datar Tarap, and Balai Adat Manggajaya directly. The interview process also took place while walking between the balai. Along the way, many customary leaders and balai elders accompanied the journey, providing explanations of history and customs. This is shown in Figure 2. The most effective approach to collecting information was casual conversation along the route, simultaneously asking various questions indirectly during the discussion.

*Source: The researcher's personal collection*

Figure 2: Regency boundary survey in 2007 and 2008.

**GPS Navigation Survey.** The Global Positioning System (GPS) is a satellite-based navigation system originally developed by the United States military to enable individuals and groups of soldiers to independently determine their positions with an accuracy of about 10 to 20 meters from their actual location. (French, 1996). Determining coordinates with GPS is often referred to as independent positioning, which uses only a single receiver capable of tracking at least four satellites to determine the location coordinates relative to the center of the earth. Nearly all GPS devices today are able to directly display the user's coordinate position. (El-Rabbany, 2002).

The selection of GPS survey techniques must be tailored to the measurement objectives, the type of device used, and must take into account field conditions such as canopy cover and other environmental factors (Ghilani, Charles D; Wolf, 2008). Location tracks for roads, bridges, and key toponyms in 2007, 2008, 2017, 2018, and 2023 were also directly collected in the field using navigation GPS.

**Data Analysis Techniques**

Spatial analysis was performed by superimposing GPS survey coordinate results with satellite imagery and administrative maps, overlaying customary boundary claims versus administrative boundaries, and processing DEMs for topography and river catchment analysis. Qualitative analysis included coding of interview narratives, exploration of socio-cultural themes, and mapping conflict patterns and community participation. Data validation was carried out through synchronization of socio-spatial sources and triangulation among field data, imagery, and community narrative findings.

**Satellite image interpretation.** Various types of geospatial data are now freely available, ranging from digital elevation models (DEM) and thematic digital maps to multispectral satellite imagery and virtual globes (Teeuw et al., 2013). High-resolution image data from Microsoft's Bing Maps is also utilized (Theilen-Willige, 2018). Bing Maps imagery can be downloaded using the SASPlanet application. In addition, other satellite images used in this study were processed from SPOT imagery. High-resolution SPOT 6 images and pan-sharpened SPOT 7 from 2016, with a spatial resolution of 1.5 meters, were acquired. All images were processed by the Geospatial Information Agency (BIG). Satellite images can also be directly accessed in the ArcGIS Pro application.

**DEM / SRTM**. High-resolution digital elevation models (DEM) from the Shuttle Radar Topography Mission (SRTM) can be accessed for free and are valuable for topographic map analysis due to their resolution accuracy (Yang, 2011). In mountainous areas covered by dense vegetation, SRTM data typically show elevations slightly higher than the actual ground surface (Su et al., 2015). Therefore, SRTM DEM is a very useful free spatial data source for contour line extraction or detailed topographic analysis (Nwilo et al., 2012). SRTM DEM data can be downloaded directly from the USGS or BIG sites for further height information processing. Terrain data can also be viewed directly using the ArcGIS Pro application.

**Geological Data.** Used as boundary information for identifying mining areas and rock or mineral structures. The data was obtained in .shp (shapefile) format issued by the Center for Geological Research and Development.

**Results and Discussion**

**Results of identification of differences in administrative delineation and customary communityclaims**

Field surveys show discrepancies between government administrative boundaries and customary land claims by the people of Balai Manggajaya. Community rejection occurred because the decision-making process did not directly involve local stakeholders. Differences between field data and administrative results have triggered conflicts over customary rights and social exclusion. These findings highlight the importance of customary deliberation in every boundary-setting process.

Spatial analysis using overlay of field survey GPS coordinates with satellite imagery revealed substantial deviations in public facility zones. Overlay maps demonstrate clear differences between administrative route designs and the community's everyday access paths. Comparison tables also identify that 30% of the community's economic access area is threatened by top-down delimitation policies (Table 1). This outcome calls for a revision of border policies that take visual evidence and participatory data into account. This is illustrated in Figure 4.

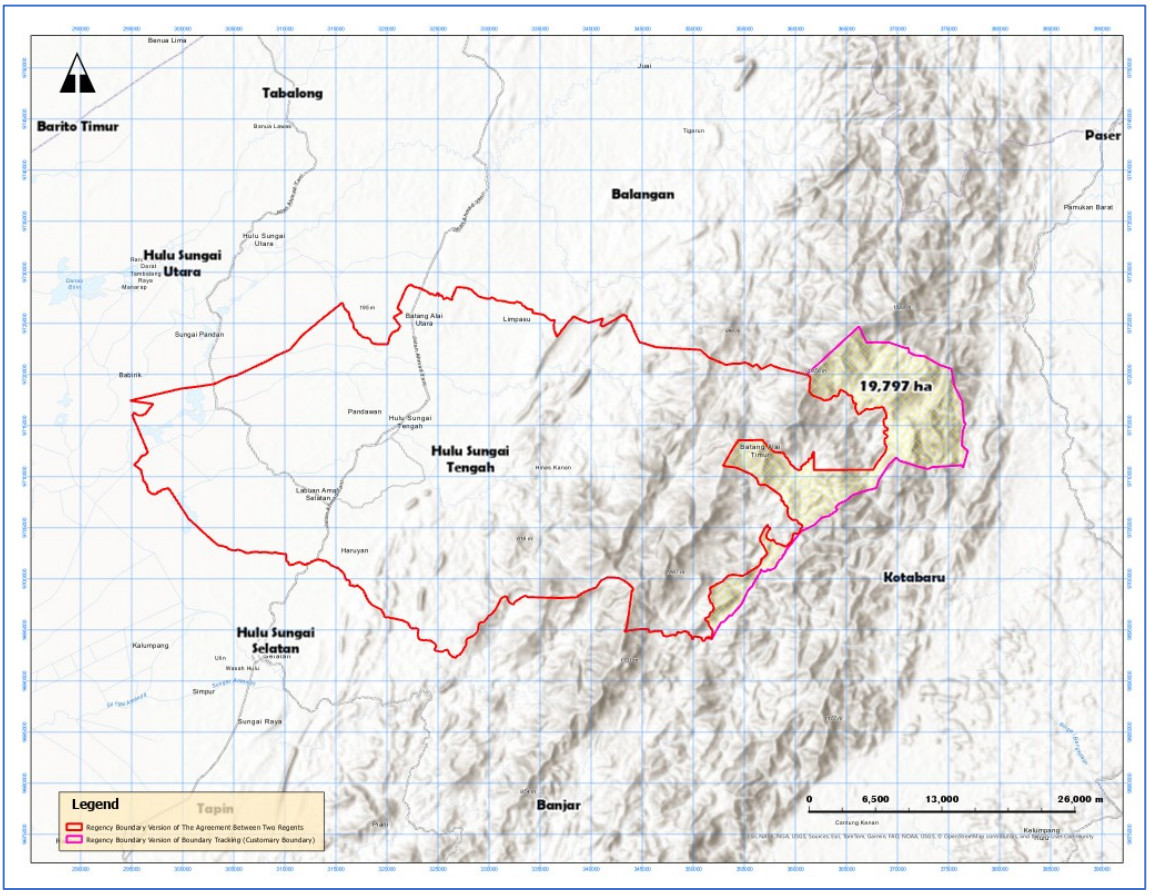
Table 1: Comparison of Administrative Boundary Delineation and Customary Land Claims in Balai Manggajaya

| **Finding Aspect** | **Administrative Boundary** | **Customary Community Claim** | **Main Discrepancy / Impact** |
|---|---|---|---|
| Land Use Zoning | Government-drawn zones | Collective ancestral land rotation | Loss of 30% economic access / social unrest |
| Public Facility Route | Planned by government | Follows daily community path | Key school bridge unreachable for children |
| Water and Environmental Access | Based on map only | River catchment as sacred, functional | Water supply threatened by new boundaries |

*Source: Processed by the researcher in 2025*

The Table 1 presents a side-by-side comparison of the official administrative boundary determination and the customary land claims in Balai Manggajaya. It highlights key areas of difference, such as land use zoning, public facility access, and the legal protection of community rights. These discrepancies reveal that administrative policies often overlook traditional practices, resulting in significant social and economic impacts. Overall, the table underscores the importance of integrating participatory and evidence-based approaches in resolving boundary disputes.

Figure 4 depicts the regency boundaries in the Meratus Mountains region, highlighting both the official government agreement and the customary community claims. The red and magenta lines contrast the two versions of spatial delineation, illustrating the conflict zone of 19,797 hectares that is subject to overlapping claims. Several neighboring regencies and natural features are also labeled for geographic context. This map is essential for visualizing the scope and impact of administrative and customary boundary disputes in South Kalimantan.




*Source: Processed by the researcher in 2025*

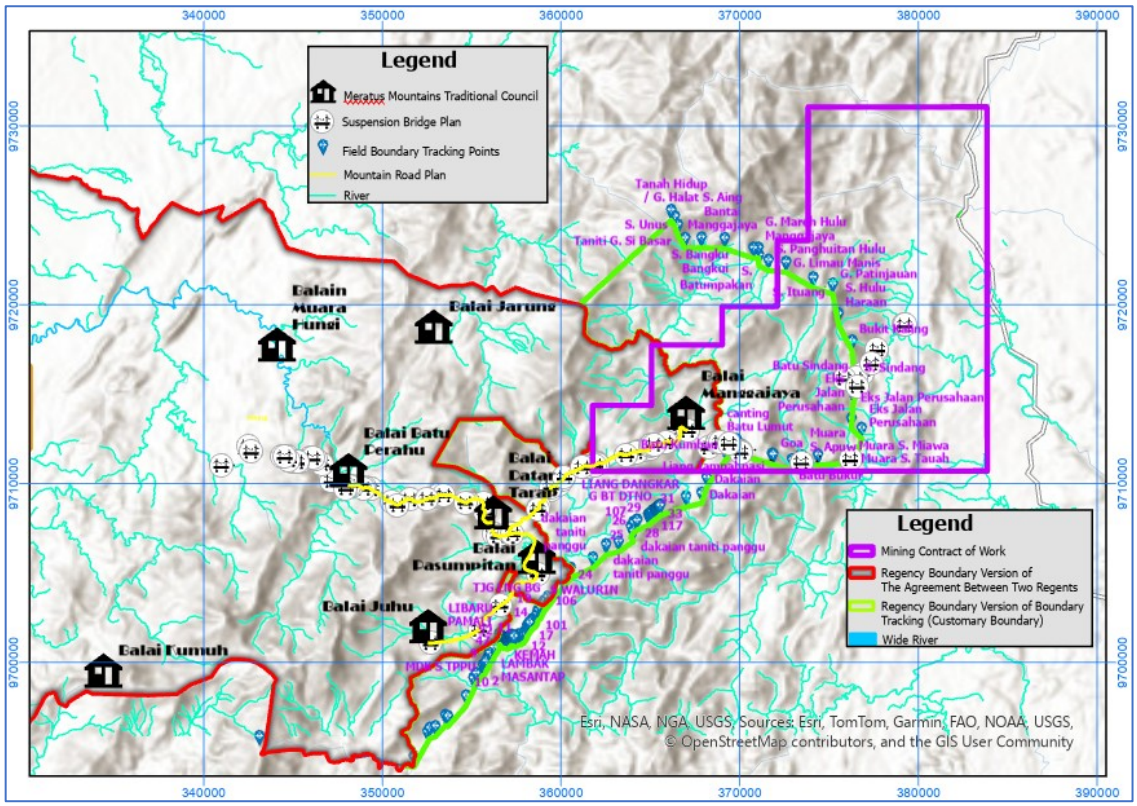
Figure 4: The difference between the results of administrative delineation and the claims of indigenous communities

**Results of analysis on reasons for rejection of boundary agreement outcomes**

Interviews with customary leaders from Balai Adat Manggajaya, Juhu, and Datar Tarap confirm the impact of boundary decisions on access to water, inherited land, and education for indigenous communities. Elders emphasized the sacred meaning of land in Dayak tradition, which is threatened when negative processes occur without dialogue. Documentation of narratives and interview data reinforces the urgency of active community

participation in boundary establishment. These results distinguish this research from studies predominantly oriented toward administrative perspectives.

Processing of DEMNAS and other topographic data clarified the actual field conditions. These new findings provide a scientific basis for local governments to improve boundary delineation. The visualization presented confirms the importance of field validation at every stage of policy formation. Comparisons with previous studies highlight that integrating field surveys, interviews, and technology produces delineated boundary maps that are more accurate than conventional administrative methods. Findings show that field verification is mandatory to ensure legal certainty and spatial justice. This research contributes to an empirically and holistically based boundary-setting model.



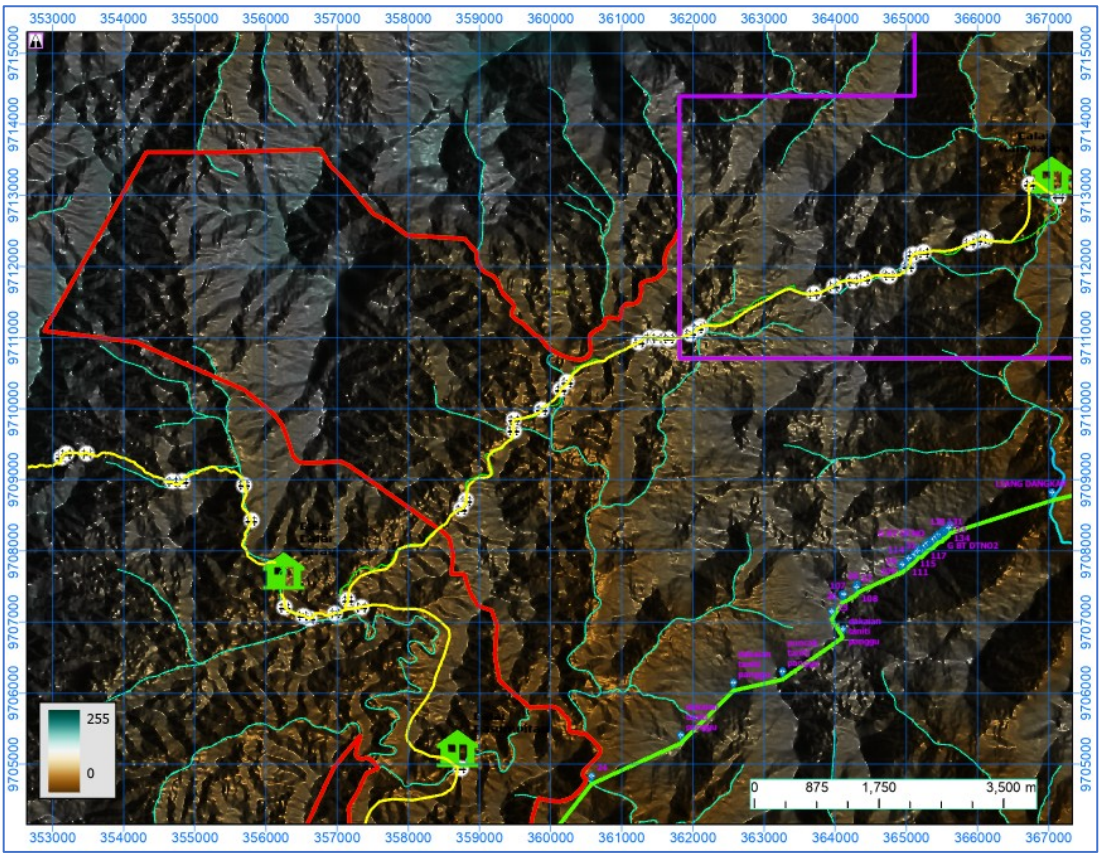

*Source: Processed by the researcher in 2025*

Figure 5: Overlay Map of Customary Territory Boundaries, Infrastructure, and Administrative Claims in the Meratus Mountains.

Figure 5 shows the map of the Meratus Mountains' customary region containing several balai adat (traditional longhouses), planned mountain roads, suspension bridges, and field boundary tracking points, each depicted with different symbols. The map also displays overlays of administrative boundary agreements between two regencies, the boundaries preferred by indigenous communities, as well as mining contract zones depicted in bold

purple boxes. Major and minor rivers in the area are marked to elucidate the use of space and natural resources within the customary territory. Overall, the map illustrates the complexity of overlapping claims, planned infrastructure, and potential land use conflicts in the Meratus Mountains area.

The significance of this research appears in the collaborative opportunities among government, academics, and customary councils for participatory spatial planning. Coordinate deviations, conflict narratives, and overlay maps become recommendations for regulatory reform on territorial delimitation. A dialogic and customary consultation approach becomes a key strategy to conflict prevention. The resulting spatial visualization format can be used for policy communication across sectors.




*Source: Processed by the researcher in 2025*

Figure 6: Village Road Route Connecting Balai Datar Tarap to Balai Manggajaya in the Meratus Mountains Area.

Visualization in the form of claim comparison tables, coordinate overlays, and DEM topographic analysis provides scientific validation tools for the interests of both communities and government. Evidence of differences between public facilities and customary land zones reinforces the urgency of policy revision. The integration of field

surveys and modern technology produces data that is verified and ready for implementation. The policy implications of the research findings are practical and applicable.

Figure 6 shows the village road route that connecting the main village in Balai Datar Tarap (RT. 01) with its sub-village, Balai Manggajaya (RT. 03), where the main route always follows the mountain terrain and regional elevation contours. This route serves as a vital access point, traversed daily by residents for various activities, including children commuting to the elementary school in the main village. The visualized road asserts the significance of village infrastructure for mobility and equitable access to education in the customary mountainous region. The existence of this route proves the essential function of space and access for the sustainability of social life and education in Balai Manggajaya.

## Conclusion and Recommendation

### Conclusion

This research has successfully identified fundamental differences between administrative boundary delineation and indigenous community claims based on history, identity, and customary rights in the Meratus Mountains region. The integration of field survey methods, spatial data processing, and participatory interviews clarifies spatial deviation, potential conflicts over resource access, as well as ecological impacts resulting from delimitation policies that ignore local community participation. The research findings strengthen scientific evidence that boundary setting based solely on administrative documents is susceptible to spatial injustice and triggers indigenous community resistance.

The main contribution of this research lies in strengthening the collaborative approach in boundary-setting practice through the integration of field data, geospatial technology, and the full involvement of traditional stakeholders and local figures in dialogue and negotiation processes. This approach not only provides more accurate and legitimate boundary maps but also enhances the sense of ownership and trust of the community in spatial policy products. This research also broadens academic understanding of the importance of customary recognition as a prerequisite for equitable and inclusive regional governance.

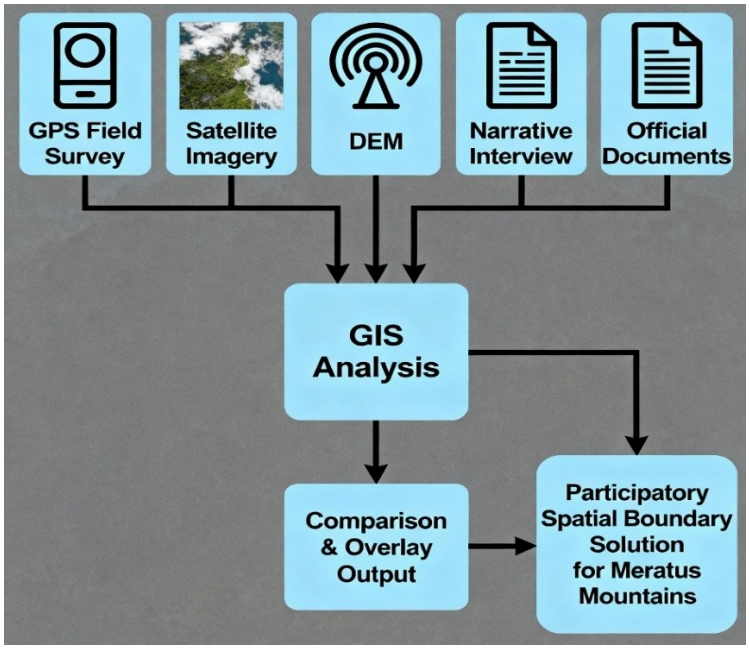
Policy recommendations prioritize boundary-setting models based on participation, field verification, and the use of transparent and easily verifiable survey technology. Every delimitation process should involve substantive customary deliberations and document community consensus as an integral part of local government decisions. In addition, protection of ecologically important areas, including water access and protected zones, must be set as main parameters in boundary policy revisions to achieve environmental

sustainability and justice for customary rights. The evidence-based spatial advocacy boundary-setting model and cross-actor dialogue developed in this research can be adopted as a reference for other regions with similar conflicts.

**Recommendations for a spatial, social, and participatory boundary setting model**

The main insight from the research is the need for a boundary setting model that integrates spatial, social, and participatory aspects comprehensively. The research findings can serve as an example for other regions facing similar disputes. Recognition of customary rights through traditional dialogue and field verification has successfully reduced the potential for spatial conflict. Fair boundary determination policy will strengthen access to public services and long-term environmental protection.

This figure shows a model of data integration flow for participatory boundary determination in the Meratus Mountains. Data from GPS field surveys, satellite imagery, DEM, narrative interviews, and official documents are processed in an integrated manner throughout the GIS analysis. The GIS process produces overlay outputs and spatial data comparison, which then become the basis for participatory spatial boundary solutions. This model highlights the importance of multi-source data and community involvement in achieving fair and evidence-based territorial boundaries.




*Source: Processed by the researcher in 2025*

Figure 7: Model of Spatial and Participatory Data Integration for Customary Boundary Determination in the Meratus Mountains.

The findings of this research affirm the critical role of evidence-based policymaking and multi-stakeholder dialogue in resolving administrative boundary disputes. By positioning indigenous communities at the heart of the boundary-setting process, this study demonstrates that surveys, interviews, and spatial visualizations can facilitate the formulation of policies that genuinely address local needs and realities. Such an inclusive framework not only enhances the legitimacy of boundary decisions but also fosters mutual trust and active participation among all stakeholders involved.

Furthermore, the research highlights that boundary-setting practices which overlook or marginalize community perspectives tend to be ineffective over time. Achieving sustainable and equitable solutions requires thorough field validation, transparent inter-sectoral communication, and the collaborative generation of spatial data in partnership with indigenous communities. By integrating these principles, boundary policies can advance both social justice and operational effectiveness, offering valuable insights for other regions facing similar territorial challenges.

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