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Ecological Dispossession, Indigenous Knowledge, and Environmental Justice in Coal Mining: A Documentary Case Study in Murung Raya, Central Kalimantan, Indonesia

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Debates about mining impacts on Indigenous communities often contrast accounts of restricted ecological access with environmental compliance records that measure different outcomes. This study examines claims concerning land and resource access, the documentary visibility of Indigenous ecological knowledge, and the comparability of environmental justice evidence in coal-mining areas of Murung Raya Regency, Central Kalimantan, Indonesia. Using a qualitative documentary case study, ten groups of publicly available sources were reviewed, including investigative reports, customary mediation coverage, legal instruments, environmental performance ratings, biodiversity assessments, published water-quality research, and corporate disclosures. The documents were coded thematically and audited for alignment of actors, locations, periods, claim types, and evidentiary strength. The analysis identified recorded complaints about land and water access, reported customary mediation, corporate activities, and official environmental assessments. However, these materials frequently refer to different spatial units, assessment periods, and evaluative criteria. An administrative rating or secondary water-quality measurement does not independently establish pollution caused by a particular coal operator; similarly, limited documentation of Indigenous knowledge does not demonstrate the disappearance of that knowledge. The study proposes an evidence-alignment matrix to distinguish reported claims, verified administrative events, measured conditions, and unresolved questions, providing a transparent basis for further environmental justice assessment.

Keywords: ecological dispossession; Indigenous ecological knowledge; environmental justice; coal mining; documentary case study

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1. Introduction

Mining expansion brings the demand for raw materials and regional revenues into contact with communities' need to maintain access to land, water, forests, and lived environments. In environmental anthropology, these effects cannot be understood exclusively through physical change or economic valuation because attachments to landscapes also encompass livelihoods, social relations, identities, and collective entitlements. Global research on extractive development conflicts has documented pressures on Indigenous lands and lifeways, while research concerning original populations in Papua has highlighted cultural losses that material indicators do not adequately capture [1], [2]. These findings establish an analytical starting point; they do not demonstrate that comparable harms have occurred within every community in Murung Raya. Kalimantan offers an important setting for examining mining as a process of spatial reorganization involving overlapping systems of land tenure and authority. Local territorial relations may be shaped by rivers, mobility routes, historical places, farming areas, and forests, rather than solely by the boundaries of mining permits. Ethnographic research among Punan Murung communities reveals

tensions between lived ecological practices and formal territorial management, while a study from East Kalimantan documents how extractive development can interact with livelihood change and social differentiation [3], [4]. Murung Raya is therefore selected not because all Dayak communities are presumed to share the same experience, but because the region enables an examination of diverse land relations and their encounters with mining governance.

Ecological dispossession should be distinguished from physical displacement alone. Loss of access to productive gardens, declining accessibility of water sources, changes in customary land use, or difficulties maintaining culturally significant sites may matter even when households remain in their original settlements. Research on resource extraction in Sorong, West Papua, situates dispossession within histories of territorial control, while a study of Nasa resistance to mining in Colombia shows that community responses are shaped by moral and political institutions [5], [6]. These studies caution against treating 'affected communities' as passive or homogeneous. A documentary investigation must accordingly distinguish experiences actually recorded in the archive from unverified assumptions about lost rights. Access to water provides one entry point for exploring the relationship between resource loss and the continuity of ecological knowledge. Knowledge about springs, seasonal patterns, plants, and customary spaces is not merely technical information; it is embedded in the ways communities sustain everyday life. Research on Aymara communities in Quillagua describes practices of enduring extractive pressure on water, whereas scholarship on the Salar de Atacama highlights ambivalent Indigenous responses to mining-related benefits, identity, and territorial change [7], [8]. Adaptation and criticism of extraction can thus coexist. For Murung Raya, comparable relations cannot be presumed without local evidence, so the present article examines how ecological access and Indigenous knowledge are represented in the available records.

Environmental disputes also concern how losses and community claims become defined in public accounts. Technical assessments may prioritize environmental quality standards, whereas residents may emphasize access, dignity, recognition of place-based histories, and the ability to influence the future of their territories. Comparative work in Canada and Sweden interprets extractive violence through environmental injustice, and global research on extractive conflicts underscores connections between territorial protection and human–nature bonds [9], [10]. These differences in measurement do not automatically make an administrative assessment wrong or a resident's complaint conclusive; each requires scrutiny of purpose, scope, source, and verification procedure. This distinction is important when corporate records, community claims, and environmental measurements are published separately. Procedural justice is another central concern because participation in a forum does not necessarily imply meaningful influence over its outcome. Records of meetings, consultations, and mediation should be read critically: who was present, what information was shared, how disagreements were documented, and whether any agreement was formally reached. Research on lithium consultation in Argentina illustrates the risks of restricted participation, while scholarship on energy-transition minerals warns about accelerating consultation and consent processes alongside project development [11], [12]. These insights guide the examination of mediation and recognition mechanisms in Murung Raya without presuming either that all forums failed or that all residents' claims were resolved.

Indigenous ecological knowledge needs to be treated as a possible source of explanation that may remain invisible in corporate documents or media accounts of disputes. Project impact indicators are commonly

defined through formal categories, although communities may understand environmental change through everyday practices, kinship relations, and resource use. Research in Argentina has shown the relevance of locally grounded indicators for lithium-mining impact assessments, while a synthesis of Indigenous well-being in mining contexts identifies relationships between ecological conditions and cultural life [13], [14]. Such findings illuminate what should be sought in the archive, but they do not substitute for evidence about actual knowledge practices among particular communities in Murung Raya. Murung Raya offers an opportunity to compare four broad documentary registers: accounts from residents and media, corporate disclosures, government decisions, and environmental assessments. The present study asks how claims about ecological access, customary mediation, corporate activities, and environmental performance can be compared when they refer to different actors, locations, times, and indicators. Its objective is to construct a source-sensitive audit that identifies both what public documentation supports and what remains unresolved. Rather than claiming to establish the full extent of ecological dispossession or changes in Indigenous knowledge, the article aims to produce a transparent, replicable approach to reviewing evidence of environmental justice in a contested mining setting [15], [16].

2. Literature Review and Problem Statement

Ecological dispossession describes processes through which communities lose, encounter restrictions on, or experience uncertainty over their ability to access and sustain ecologically significant territories and resources. Its consequences may involve livelihoods, social relationships, customary rights, and cultural meaning, not only the transfer of formal property. A planetary justice perspective highlights Indigenous and traditional communities' distinctive ways of knowing and being, while research from the Atacama region illustrates how the appropriation of water can reproduce unequal power relations [17], [18]. The implication for the present study is that compensation figures or permit boundaries cannot alone capture the social meaning of environmental change. Nevertheless, evidence of a reported access dispute must not be equated with independently established ecological dispossession. Research on mining and Indigenous peoples identifies multidimensional consequences extending from livelihood and health changes to resource governance and cultural continuity. The severity of such effects and the forms of community response depend on local histories, commodity types, power relations, and participation in decision-making. Indigenous ecological knowledge is especially relevant because it develops through sustained social and environmental relations rather than existing as context-free technical information. A systematic synthesis of mining impacts and a study of Cree traditional ecological knowledge in mine-site revegetation both demonstrate the potential importance of local knowledge for diagnosing problems and designing restoration [19], [20]. Neither publication, however, provides direct evidence of contemporary knowledge conditions in Murung Raya.

Political ecology situates extraction within processes of resource control shaped by development policies and relations among actors. Energy-transition minerals, for instance, may be promoted as climate solutions while simultaneously generating questions about displacement, resource access, and territorial reorganization. Research on lithium extraction in Zimbabwe shows the importance of examining climate mitigation alongside displacement, whereas relational approaches to extraction on Indigenous land emphasize that stakeholders may hold different understandings of people, territory, and economic activity [21], [22]. Such differences can generate competing assessments of the same mining project. Documentary research should therefore record rival frames of knowledge and authority rather than assigning truth to

one account in advance. In environmental anthropology, Indigenous knowledge also informs the meaning of successful land rehabilitation and ecological restoration. Technical metrics such as soil stability, vegetation cover, or compliance with a reclamation plan may not capture the recovery of places that carry cultural value and everyday functions. Accordingly, evaluations of mining should ask whether corporate and governmental indicators recognize environments as understood by affected communities. Research on First Nations' cultural values in mine rehabilitation and Indigenous participation in mine closure emphasizes substantive engagement, the compatibility of rehabilitation goals, and recognition of territorial values [23], [24]. These studies supply an analytical lens for Murung Raya, not evidence that any particular local rehabilitation program has succeeded or failed. Environmental justice in mining encompasses distributive, procedural, recognition-based, and epistemic dimensions. Distributive justice concerns who receives benefits and bears harms; procedural justice concerns access to information and decision-making; recognition justice concerns collective identities and entitlements; and epistemic justice concerns whose knowledge is heard and applied. Free, Prior and Informed Consent (FPIC) is important, but its implementation may be constrained by asymmetries in authority and negotiating power. Comparative research on Indigenous participation in extractive projects and state–company–community interactions in Canada and Sweden indicates that formal procedures must be considered alongside decision-making structures and communities' ability to accept or reject projects [25], [26]. Hence, a recorded meeting cannot on its own establish procedural fairness.

Water rights and food sovereignty illustrate links between ecological dispossession and the continuity of sociocultural practices. Reduced access to water or altered water governance can affect production, consumption, and places with communal meaning. Disruptions to food sources from forests, rivers, or gardens likewise extend beyond income loss because they implicate dietary choice, situated skills, and intergenerational relations. Research on Indigenous water-rights conflicts involving Chile's lithium industry and a global review of mining's consequences for Indigenous food sovereignty show the diversity of mechanisms involved [27], [28]. Causal attribution nevertheless requires evidence aligned by pressure source, location, period, and indicator. In Murung Raya, findings from gold-mining water-quality research cannot simply be attributed to a specific coal operation. The research gap addressed here is the limited systematic alignment of community claims, corporate information, administrative decisions, and environmental assessments that use different units of analysis. Research on nickel mining in Indonesia shows that forest-cover indicators and well-being outcomes may not move in the same direction, while scholarship on lithium extraction in Bolivia demonstrates how actors frame territorial scale, benefits, and economic futures [29], [30]. Together, these insights support the need to distinguish visible archival indicators from residents' experiences that remain poorly documented. The study therefore asks: to what extent do records of ecological access claims, customary recognition, corporate activities, and environmental assessments in Murung Raya describe genuinely comparable actors, locations, periods, and issues? Its intended contribution is an evidence-alignment matrix, not a claim that all mining impacts or transformations of Indigenous knowledge have already been proven.

3. Method

This study adopts a qualitative documentary case-study design focused on publicly available records concerning coal-mining activities associated with PT Borneo Prima and the Tumbang Olong area of Murung Raya Regency, Central Kalimantan. It considers documents published and events traceable from

2020 through 16 October 2026; some sources describe earlier developments as historical context. No interviews, ethnographic observation, independent laboratory testing, or original satellite-image classification were undertaken. Consequently, the findings are limited to what can be supported by the documentary corpus.

The corpus was assembled purposively using searches for the company's name, village names, land disputes, the Dayak Customary Council, the Indonesian PROPER environmental rating program, biodiversity, water quality, and customary community regulations. Ten groups of core sources were retained because they provided traceable information on their publisher, date, scope, or data. Peer-reviewed articles were used as conceptual comparators, whereas news reports, civil-society assessments, government instruments, and corporate disclosures formed the case-specific materials. Reports derived from the same original reporting pathway were not treated as independent confirmations merely because they appeared on multiple websites.

Analysis consisted of source metadata inventory, thematic coding (land access, water quality, customary recognition, mediation, corporate activity, and administrative compliance), comparison of actors–locations–times, and classification of evidentiary support. Status V denotes identifiable official or administrative evidence; A denotes a publicly attributed statement or allegation; and M denotes a measurement or assessment with a specified scope and method. Combined statuses were allowed, but an attributed allegation was never upgraded into a causal fact solely because it appeared alongside an administrative or measured record. Alternative explanations and missing corroboration were logged for each issue.

Two rules guided inference. First, a source supports only propositions within its unit of analysis: a PROPER rating relates to performance under the rating program's criteria, not automatically to compensation justice; a water sample at a particular point does not independently identify the responsible operator. Second, the absence of details from an accessible archive was treated as a limitation of documentation rather than evidence that a practice or event never occurred. Findings were presented through a source inventory and an evidence-alignment matrix, which together enable transparent review of supported and unsupported inferences.

Table 1. Inventory of Documentary Sources for the Murung Raya Case

Code	Source	Documentary evidence	Website (plain text)
D01	Public Eye (2023)	Investigation; attributed statements on land, water, and transport dust	stories.publiceye.ch
D02	Balanganews (2023)	CSR meeting; reported corporate activities and statements	balanganews.com
D03	Balanganews (2024)	Dayak Customary Council mediation; compensation claims	balanganews.com
D04	Domain Rakyat (2025)	Takalot Block land claims; reported dispute developments	domainrakyat.com
D05	AEER (2022)	Biodiversity threat assessment; not a social-impact audit	aeer.or.id
D06	Ministry of Environment and Forestry (2023)	PROPER environmental performance decision, 2022–2023	proper.menlhk.go.id
D07	Fery et al. (2023)	Published Barito River water-quality study; gold-mining context	garuda.kemdiktisaintek.go.id
D08	Murung Raya Government (2025)	Regent Regulation No. 29/2025 on customary institutions	peraturan.bpk.go.id

Code	Source	Documentary evidence	Website (plain text)
D09	PT Hillcon Tbk (2025)	Corporate disclosure regarding a mining-services contract	hillcon.co.id
D10	Ministry of Environment (2025)	PROPER announcement concerning 2023–2024 assessment	proper.kemenlh.go.id

Note: D01–D10 designate case-specific documentary sources, some without DOIs. Website names are shown as plain text rather than clickable links. Statements reproduced in news coverage are attributed reports, not interviews conducted by the authors.

4. Results and Discussion

Claims of Ecological Access Loss and Dispute Resolution

A 2023 investigation by Public Eye (D01) recorded statements from residents around Tumbang Olong concerning productive trees, water sources, dust from transport activities, and places with social importance to families. These accounts indicate that ecological access claims in the public record extend beyond plot sizes or commodity prices to the ability to use places in daily life. Each statement is coded here as a claim attributed to the original speaker and reporting outlet. It is sufficient to identify a contested issue but not, by itself, to calculate losses, determine legal ownership, or establish a causal link between every environmental complaint and a single mining operator.

Coverage of a mediation event dated 15 March 2024 (D03) indicates the involvement of the Dayak Customary Council in efforts to address land-related claims. The report recorded differing negotiating figures of IDR 1,700 and IDR 1,400, described using the ambiguous unit 'per meter', which cannot confidently be interpreted as a unit of area. The account documents negotiation and disagreement rather than a legally established final settlement. Because signed minutes, parcel lists, payment records, and the full agreement were unavailable, the figures are not converted into compensation rates per square meter. A more defensible reading is that monetary valuation became one object of negotiation while the ecological and social significance of land remains a separate question.

Reporting about the Takalot Block dispute in 2025 (D04) adds a further chronological layer because it records demands for recognition and compensation linked to residents of Tumbang Olong II and Mantiat Pari. However, the appearance of similar claims in several reports does not necessarily mean there are multiple independent witnesses or sources; the provenance and interdependence of news accounts must be checked. The article accordingly codes this material as documentation of continuing claims, not as a legal determination of parcel boundaries, tenure validity, or an environmental cause. This approach preserves the usefulness of a dispute chronology without treating unverified press accounts as settled legal facts.

Corporate sources provide a different vantage point from records of disputes. Reporting on a corporate social responsibility meeting in 2023 (D02) establishes that a communication forum was publicized, while a 2025 corporate disclosure about a mining-services contract (D09) records an arrangement for business operations. Together, these sources identify institutional activities and commercial relations but do not directly demonstrate which households obtained employment, how benefits were distributed, or whether land use changed on disputed parcels. A social program therefore cannot be equated with universal community satisfaction, just as a service contract cannot be used as a measurement of physical mine expansion.

The synthesis reveals an initial pattern in which ecological access claims, compensation negotiations, customary institutions, and corporate program statements appear in separate documentary registers. What can reasonably be concluded is that relevant claims and institutional processes were recorded during the study period, not that ecological dispossession was independently established for every land parcel. Strengthening the evidence would require matching dispute locations with authoritative cadastral and mining-permit boundaries, obtaining authenticated mediation minutes, and tracking compliance with any agreements. Until then, the article's contribution lies in clarifying differences among records and specifying which environmental justice questions remain open.

Biodiversity Assessment, Water Measurement, and Attribution Limits

The 2022 report of Aksi Ekologi dan Emansipasi Rakyat (D05) assigned PT Borneo Prima a biodiversity-threat score of 4, categorized as low under the report's own methodology. This score helps explain how ecological risk was represented through selected biological indicators; it is not a comprehensive measure of changes in land access, customary recognition, health, or compensation fairness. The score must moreover be interpreted in relation to the assessment year, spatial unit, assumptions, and indicator definitions. This study therefore does not interpret the 'low' category as proof that no social-ecological concerns exist, nor does it use the rating to dismiss residents' documented complaints.

A Barito River water-quality study by Fery and colleagues published in 2023 (D07) provides a different kind of evidence because it includes measurements at a monitoring point identified as being in Tumbang Olong II. One reported result was a Pollution Index of 1.40 at the first point, classified as lightly polluted under that method. The figure pertains to the sample, measurement period, and index in the cited study; it cannot be generalized to the entire river throughout 2020–2026. Importantly, the water-quality publication discusses small-scale gold-mining activities. Reinterpreting its findings as proof of pollution from a particular coal-mining operator would exceed the design and scope of the original source.

Differences between water-quality assessment methods should be understood as questions of comparability rather than immediate factual contradiction. Related publications by researchers from the same group also used the STORET method, with different monitoring-point counts and rating criteria. Any comparison needs to account for sampled parameters, standards, timing, and potential overlap between underlying datasets. Two papers that may rely on the same measurement episode or research team do not automatically constitute independent evidence. This dependency is recorded in the audit matrix before interpretation, preventing publication counts from being mistaken for independently corroborated pollution events.

Biodiversity assessment and water-quality measurement address different units of analysis: one scores threats to particular biological components, while the other evaluates physical or chemical conditions at sampling locations. Neither directly establishes whether residents can still use customary water sources, whether everyday river practices have changed, or whether ecological knowledge continues to be transmitted across generations. Exploring those links would require precise monitoring coordinates, repeat observations, verified mining-activity maps, and documentary or participatory evidence of resource use. Collapsing dissimilar indicators into a single composite claim about 'mining impacts' would therefore risk misleading conclusions.

A principal finding of this section is the limited cross-source attribution that the available records permit. Quantitative environmental evidence exists for Murung Raya, but the sampled locations, types of mining discussed, and measurement frameworks do not necessarily align with questions concerning customary rights and coal-mining impacts. Public documents also provide insufficient direct information about changes in Indigenous ecological knowledge from one generation to another. The study deliberately refrains from concluding either that such knowledge has disappeared or that a specific operator is the sole source of water-quality problems. A more robust assessment would require georeferenced monitoring, an official digital permit boundary, and verifiable documentation of community resource use.

Table 2. Evidence-Alignment Audit of the Main Case Claims

Research aspect	Findings documented in available sources	Evidence not yet established
Land and gardens (D01, D04 · A)	Residents' complaints and compensation demands are recorded.	Parcel boundaries, legal status, extent of loss, and resolution.
Customary mediation (D03 · A)	Mediation and differing negotiating positions were reported.	Authenticated minutes, final agreement, payment, and measurement unit.
Corporate activities (D02, D09 · V/A)	CSR activities and a mining-services contract were documented.	Distribution of benefits and the extent of physical land clearance.
Biodiversity (D05 · M)	A threat score was reported under a defined assessment method.	Conditions across all sites and effects on customary rights.
Water quality (D07 · M)	Barito River water quality was measured at identified sampling points.	Causal attribution to a particular coal operator.
PROPER (D06, D10 · V)	Environmental performance ratings were published for defined periods.	Resolution of land disputes or meaningful community consent.
Customary institutions (D08 · V)	A regulation concerning support for customary institutions exists.	Its implementation in particular disputes.

V = identifiable administrative record; A = attributed statement or allegation; M = measurement or assessment with defined scope. The codes are not statistical scores and do not represent legal judgments.

Environmental Compliance, Mediation, and Lived Justice

The PROPER decision for 2022–2023 (D06) lists PT Borneo Prima with a Blue rating, an administrative classification that must be interpreted within the program's criteria and assessment period. It provides evidence about the government's environmental management evaluation but does not directly resolve land-right claims, compensation fairness, or the quality of community consent. Later PROPER information announced in 2025 (D10) offers additional administrative context that should be checked against the specific decision annex. It would therefore be incorrect to infer that formal compliance proves an absence of conflict; the rating and environmental justice questions examine different dimensions.

In spatial analysis, the area stated in a historical permit record is not equivalent to the land actually cleared in a particular year. Research mapping the intersection of critical mineral projects and Indigenous land rights, alongside analyses of mining permit and land-use risks in Indonesia, shows the need to distinguish permit coverage, actual land use, and the territories to which communities assert rights [31], [32]. For Murung Raya, this study did not obtain a verified official digital concession polygon or independently audited satellite-image classifications. It therefore does not calculate forest loss 'inside the PT Borneo Prima permit', nor does it treat proximity to a mine as proof that a settlement lies within the licensed area.

Environmental justice in this case also requires a distinction between the existence of a procedure and the achievement of a substantively fair outcome. News sources report corporate social responsibility meetings and customary mediation, but accessible documents do not fully disclose participant lists, deliberation minutes, land-valuation methods, follow-up complaints, or final resolutions. Questions remain about who participated, whether dissenting parties could raise objections, and whether any agreement was implemented. Rather than deeming a procedure successful or unsuccessful solely because a forum took place, the analysis identifies the specific records needed to evaluate procedural justice with greater confidence.

Research on information limitations in mining impact assessments shows that official and corporate sources can produce indicators that differ from community experiences; scholarship concerning Kichwa storytelling in the Amazon likewise emphasizes relational knowledge in understanding extractive conflicts [33], [34]. These comparisons are not treated as additional empirical evidence from Murung Raya, but as reasons why distinct documentary registers cannot simply be merged. While corporate reporting may foreground business operations, PROPER measures administrative environmental performance, and news accounts emphasize residents' objections, a defensible synthesis must match actors, locations, periods, and propositions across those accounts.

The misalignment of available evidence is itself a finding that documentary research can support. Administrative records demonstrate that environmental ratings were issued; media archives record contested claims and reported mediation; meanwhile, authoritative spatial evidence and documents showing substantive dispute outcomes remain limited. This does not establish an administrative violation or negate residents' experiences. Instead, it identifies the evidentiary threshold needed before compliance claims and justice claims can be compared fairly. A practical implication is to develop cross-referenced records linking environmental assessments, grievance registers, mediation outcomes, and authoritative spatial data with explicit dates and institutional provenance.

Indigenous Knowledge and the Need for Stronger Evidence

Publicly accessible materials on Murung Raya more frequently discuss parcel areas, compensation claims, corporate social responsibility meetings, and mediation than they discuss springs, forest-gathering routes, seasonal signs, culturally valued plants, or places of customary significance. This asymmetry concerns the visibility of knowledge within the archive; it is not a measure of a community's loss of capability or tradition. Similarly, an absence of discussion in the news does not prove deliberate disregard of community knowledge by either the company or government. Establishing such a claim would require consultation minutes, sociocultural impact records, or direct statements from the relevant actors.

Research on water coloniality in Shuar territories underscores everyday relationships between communities, rivers, and land, while an analysis of Australian mining legislation demonstrates how ecosystem services and Indigenous well-being may be represented incompletely in formal rules [35], [36]. Conceptually, these studies explain why land cannot be reduced to sale price or administrative classification. For Murung Raya, this comparison motivates further inquiry into whether mediation and customary institutions provide space for community ecological explanations. The actual effectiveness of an institution or the acceptance of local knowledge, however, cannot be verified simply from a regulation or a report that a meeting took place.

Relational Indigenous well-being cannot always be expressed in monetary terms, and community attitudes toward extraction may vary by experience, livelihood, and social position. Studies on ecosystem services and Indigenous well-being, as well as research on negotiations around extractive activity in the Peruvian Amazon, emphasize this heterogeneity [37], [38]. The current study therefore does not treat every resident of Tumbang Olong or every Dayak community as holding a single view. Because interviews were not conducted, it also cannot establish differences in experience by generation, gender, or participation in mining employment.

Research on post-mining restoration in Australia identifies opportunities for Indigenous participation in defining beneficial outcomes, while a review of Indigenous knowledge in mining operations underscores the importance of substantive institutional arrangements rather than symbolic acknowledgment [39], [40]. These studies serve as conceptual comparisons, not substitutes for Murung Raya field evidence. Their application here is to ask how community information is recorded, used, and responded to in official decisions. Such documentation should respect access permissions, the confidentiality of sacred locations, and communities' rights to control the disclosure of sensitive knowledge.

The methodological implication is to establish an integrated evidence register containing, at minimum, source identity, the person or institution making each statement, coordinates or administrative locations, the event period, indicators used, response documents, and the status of follow-up action. Such a register would make it possible to assess whether apparently competing claims actually concern the same object while revealing which questions remain unanswerable because information is missing. The article's contribution therefore concerns auditing comparability across ecological, social, and administrative records, not claiming to have measured all changes in Indigenous knowledge. Further investigation could strengthen this evidence through official maps, environmental impact assessments and monitoring plans (AMDAL/RKL-RPL), authenticated mediation records, and ethically obtained community participation.

5. Conclusion

The study demonstrates that coal-mining issues in Murung Raya cannot be understood from a single type of document or environmental indicator. The public archive records claims about changing access to land and resources, customary mediation, corporate activities, biodiversity assessment, water-quality measurement, and PROPER evaluations. Each source addresses different aspects of the case and often employs distinct locations, timeframes, methods, and assessment objectives. The central finding is therefore not that all reported effects were conclusively caused by one company; it is that ecological, social, and administrative evidence must be interpreted together while retaining their distinct evidentiary limits.

Regarding ecological conditions, the biodiversity threat assessment and published water-quality measurements supply quantitative information, but they do not independently establish the source of pollution, environmental changes within verified concession boundaries, or the loss of community resource-use rights. A licensed area is also not equivalent to the area actually cleared. Differences among sampling points, operating areas, and event periods require caution when attributing impacts. Without official digital concession boundaries, complete AMDAL/RKL-RPL records, and comparable monitoring data, this study does not estimate environmental damage specifically caused by coal activities at the case locations.

In social and institutional terms, reporting on land disputes, compensation, and mediation indicates that community recognition and the resolution of claims must be examined separately from administrative environmental compliance ratings. PROPER addresses environmental management performance under governmental criteria for a defined period; environmental justice additionally concerns benefit and burden distribution, participation, rights recognition, and the place of local knowledge in decisions. Available documents do not establish whether residents' demands were substantively resolved or how customary ecological knowledge is transmitted and transformed. Such documentary omissions limit inference; they do not establish the absence of Indigenous knowledge.

The contribution of this study is an evidence-alignment matrix that distinguishes attributed claims, administrative decisions, and environmental measurements by provenance, location, period, indicator, and verification status. Governments, companies, and customary institutions would benefit from publicly accessible permit boundaries, auditable environmental monitoring records, documented mediation outcomes, and knowledge documentation governed by community consent. Future research should link these records to reproducible geospatial analysis or ethically collected participatory evidence. Given the limitations of the present sources, these conclusions describe a documentary analysis, not a legal judgment or a causal demonstration of impacts attributable to a specific operator.

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