3D GIS PARTICIPATORY MAPPING AND CONFLICT LADM: COMPARATIVE ANALYSIS OF LAND POLICIES AND SURVEY PROCEDURES APPLIED BY THE IGOROTS, NCIP, AND DENR TO ITOGON ANCESTRAL DOMAIN BOUNDARIES

D. A. Apostol*, D. A. Apostol, O. T. Macapinlac, G. S. Katigbak

Department of Geodetic Engineering, University of the Philippines, Diliman, Quezon City, Philippines
(daapostol, daapostol1, otmacapinlac, gskatigbak)@up.edu.ph

KEY WORDS: Ancestral Domain, GIS, Indigenous People, Land Policies, Participatory Mapping, Surveying, Survey Procedures.

ABSTRACT:

Based on the 2015 census, the Indigenous Peoples (IPs) population in the Philippines is estimated to range from 11.3 to 20.2 million. Spanning diverse regions with unique cultures, these communities face common challenges related to territorial disputes. Itogon, the largest municipality in Benguet, is the ancestral home of the Ibaloi, Kankanaey, and other Igorot tribes. Despite possessing three Ancestral Domains (ADs), Itogon is predominantly classified as timberland, exposing inconsistencies in national laws and jurisdiction. This study examines land policies and surveying procedures employed by the Igorots, National Commission on Indigenous Peoples (NCIP), and Department of Environment and Natural Resources (DENR) in mapping Itogon's AD Boundaries. It aims to identify conflicts in land boundary delineation, propose surveying guidelines, and advocate for 3D Participatory Mapping as a geomatics solution for updated AD reference maps. Three methodologies were used: Interpretative Phenomenological Analysis (IPA), Comparative Legal Analysis (CLA), and Map Overlay Analysis (MOA). IPA revealed key themes, including AD Definition, AD Overlaps, and Other Conflicts, pertinent to AD mapping. CLA delved into conflicting surveying procedures, such as AD Definitions, Surveying Equipment, Methods, and more. MOA highlighted the land area percentage affected by misaligned surveying procedures. The study presents its findings through a Conflict Land Administration Domain Model (LADM) for AD versus AD and Political Boundaries. These can serve as references for revising survey manuals, updating AD Sustainable Development and Protection Plans, and making amendments to laws, all aimed at promoting indigenous land rights and sustainable development.

1. INTRODUCTION

1.1 Background

In 1997, the NCIP was established under Republic Act No. 8371, known as the "Indigenous Peoples' Rights Act," to safeguard IP rights and ancestral territories, issuing CADTs and CALTs. Prior to this, the DENR managed boundary delineation with a focus on national interests. This shift from DENR to NCIP oversight resulted in differing approaches to recognizing boundaries and led to resource and cultural conflicts. These issues, often favoring businesses over affected communities, sometimes escalate to armed resistance as communities seek to defend their land (Sarmiento, 2012; Prill-Brett, 2007).

Igorots, a significant Indigenous group in the Philippines, are named after their mountainous Cordillera homeland, known for rice terraces and a history of headhunting. American colonization introduced land titling, disrupting their communal culture (Albano, 2022).

Itogon, Benguet, known as a "gold haven" due to its abundant deposits, is surrounded by Baguio and La Trinidad, known for tourism and education. Itogon was a pioneer in large-scale mining, with a portion of its land used for the Binga Dam in the 1950s. Today, many barangays are involved in small-scale mining, facilitated by the Baguio-Bua-Itogon-Dalupirip National Road (Itogon Government, n.d.).

1.2 Research Objectives and Significance

This research aims to compare and contrast land policies and survey procedures in boundary mapping between the Igorots, NCIP, and DENR in Itogon Ancestral Domain and Municipality boundaries, and recommend geomatics solutions and survey guidelines as references on revising survey manuals, updating AD Sustainable Development and Protection Plans, and advancing potential legal amendments. It revealed that adopting modern approaches, such as the Three-dimensional Geographic Information System (3D GIS) method in participatory mapping and Conflict Land Administration Domain Model (LADM), effectively identified overlapping land areas and the ensuing conflicts over rights, responsibilities, and restrictions among the agencies. Identifying these contested areas play a crucial role in the existence of intersecting land policies and disputes related to the ownership and management of ADs.

2. REVIEW OF RELATED LITERATURE

2.1 Challenges in Ancestral Domains

Ongoing international disputes over territorial boundaries in the Philippines, according to Bautista (2011), create obstacles to the recognition and protection of ancestral domains, particularly affecting indigenous communities like the Igorots. As stated by Molintas (2004), land ownership struggles result in land grabbing and the conversion of ancestral lands into private properties, driven by conflicts between the Indigenous People Rights Act (IPRA) and existing laws, complicating the formal land titling process. The Itogon municipality faces challenges related to diverse terrain, dam construction impacts, and mining activities that affect land classification and ownership. Moreover, overlapping land policies among government agencies such as the National Commission on Indigenous Peoples (NCIP) and the Department of Environment and Natural Resources (DENR) require resolutions and memoranda for resolution according to Prill–Brett (2007). Overall, these issues highlight the importance of comprehensive policy reviews and alignment to protect indigenous rights and conserve

---

* Corresponding author

their cultural heritage and natural resources.

2.2 Existing Geomatics Tools For Ancestral Domain Mapping

Two key tools for participatory mapping, Participatory 3-D Modeling (P3DM) and Geographic Information Systems (GIS), are described. P3DM involves creating georeferenced 3-D models that can represent geographic features and community knowledge but lacks mobility. GIS, on the other hand, utilizes computer technology for mapping and analysis, offering credible and versatile maps, but it often comes with a steep learning curve and operational costs (De Vera and Claps, 2017). Another tool introduced is the Land Administration Domain Model (LADM), which aims to describe land administration systems, focusing on rights, responsibilities, and geospatial components. Finally, the role of anthropology in the Certificate of Ancestral Domain Title (CADT) processing is discussed, emphasizing the importance of anthropological proofs, capacity-building, mediation, advocacy, and ensuring accurate representations throughout the application process to support indigenous communities in securing their ancestral land rights (ISO 19152, 20152).

2.3 Geospatial Technology

Technology has become crucial for geographical understanding and construction efficiency. Remote sensing, via aerial platforms and satellites, facilitates precise Earth mapping and supports applications like land use planning, environmental monitoring, and disaster management. Surveying instruments, including laser scanners and GNSS receivers, have revolutionized data collection, offering precise 3D measurements and real-time positioning (USGS, 2022). Moreover, according to NAMRIA (2016), modernizing the Philippine Geodetic Reference System is imperative due to the changing landscape and geological shifts in the country. The existing PRS92 system, established over two decades ago, no longer accurately reflects these changes, necessitating an update to maintain accurate mapping and surveying.

3. METHODOLOGY

3.1 Initial Data Acquisition

The researchers used various sampling techniques, including purposive, snowball, and quota sampling, to select participants and collect data systematically. The research took place in Itogon, Benguet's largest municipality, known for cultural diversity and ancestral domains. However, conflicts arose due to significant land allocation for mining in the area, impacting the Ibaloi, Kalanguya, and Kankana-ey indigenous communities residing across 49,800 hectares. While a portion of this land was declared a Watershed Forest Reserve, the majority was allocated for mining, leading to changes in customary laws and community conflicts, as documented by Albano in 2014.

3.2 Research Instruments

These instruments include legal documents like the Indigenous Peoples Rights Act of 1997 (IPRA), DENR Administrative Order 1993-02 (DAO 1993-02), and NCIP Administrative Order No. 1 of 2020 (AO 2020-01). Additionally, the study utilizes tools such as research interview questionnaires, Quantum Geographic Information System (QGIS) for participatory mapping, Lucidchart for creating a Land Administration Domain Model (LADM), and various Digital Elevation Models (DEMs) like Benguet 10m IfSAR and Radarsat Antarctic Mapping Project (RAMP) 200

DEM. These instruments collectively contribute to the comprehensive analysis of Itogon's ancestral domain boundaries.

3.3 Workflow

The workflow comprised several key stages: conceptualization, involving topic selection, purpose assessment, and feasibility consultations; research, involving a review of relevant literature; data collection, involving interviews with knowledgeable individuals and the use of existing legal documents; and data processing, which included Interpretative Phenomenological Analysis (IPA), Comparative (Legal) Analysis, and Map Overlay Analysis as discussed further in the Data Analysis section.

3.4 Data Analysis

The data analysis in this study employs three key approaches: Interpretative Phenomenological Analysis (IPA), Comparative (Legal) Analysis, and Map Overlay Analysis. IPA is utilized to explore the life experiences and perspectives of co-researchers through interviews, aiming to uncover insights and themes in the data. Comparative (Legal) Analysis is employed to compare DENR DAO 1993-02 and IPRA in terms of NCIP AD delineation policies, involving steps to develop comparative skills and evaluate legal data points. Map Overlay Analysis focuses on visualizing and analyzing spatial data layers, aiding in understanding spatial relationships. These three approaches together provide a comprehensive understanding of the research topic, incorporating qualitative, legal, and spatial data analysis elements.

4. RESULTS AND DISCUSSION

IPA and CLA serve the purpose of comparing and contrasting land policies and survey procedures for boundary mapping between the Igorots, NCIP, and DENR in Itogon Ancestral Domain and Municipality boundaries, ultimately leading to the recommendation of survey guidelines. On the other hand, MOA addresses the second objective of recommending geomatics solutions.

4.1 Interpretative Phenomenological Analysis

Information gathered from interviews with co-researchers from Indigenous Peoples (IPs), NCIP, and DENR in Itogon underwent Interpretative Phenomenological Analysis (IPA) to explore the unique life experiences related to AD delineation in Itogon. The analysis identified three master themes and ten superordinate themes (Table 1), including Ancestral Domain Definition, Ancestral Domain Overlaps, and Other Conflicts. These themes were derived by connecting themes chronologically across multiple cases (Smith and Osborn, 2007). This comprehensive analysis offers valuable insights into the complexities of AD delineation in Itogon, based on trustworthy and valid responses from co-researchers who directly experienced the study's focus. Irrelevant information was excluded to provide precise and focused answers, and all co-researchers provided informed consent for their participation:

Igorots: Hon. Norberto Pacio and Sir Romeo Pocding
NCIP: Engr. Layman Bang-ao
DENR: Forester Nicanor Dao-ayen and Engr. Mariden Bantales

4.1.1 Superordinate Themes Interpretations: *Rights:* Land use in Ancestral Domains, communal among Indigenous communities,

is governed by IPRA Section 7, emphasizing communal ownership and conservation.

Responsibilities: IPs struggle with forest management due to government intervention. DENR supports AD protection with technical assistance, while NCIP conducts surveys, but land classification is overlooked. NCIP Administrative Order No. 1-2004 guides AD Sustainable Development and Protection Plan per IPRA.

MASTER THEMES	SUPERORDINATE THEMES
"Ibig sabihin yung private communal it includes yung parang territory. Parang equative yan sa isang municipality. Kung ano ang nandoon sa territory, kasama yan sa AD."	Rights
	Responsibilities
Ancestral Domain Definition	Restrictions
"Hindi iisa ang land classification—iba. May... yung mga area na forest land timber land, mayron ding within inside ka ng patented mining claim."	Land Classifications
	Political Boundaries
	Ancestral Domains
Ancestral Domain Overlaps	Land Laws/Policies
"Sabi naman kasi, ang argument ng DENR at ng LRA at ng DAR, sabi sa section 56, mare-respeto. Pero we have to agree kung ano ang interpretation natin sa "shall be respected."	with Other Agencies
	Misinterpretations
Other Conflicts	Suggestions

Table 1. Master Themes and Related Superordinate Themes

Restrictions: Indigenous forest resource management varies, with LGU allowing IP cultural access, while DENR may require permits. NCIP worries about DENR restrictions, emphasizing ICCs' sustainable practices. DENR stresses guidance or permits for forest product gathering, pending aerial surveying.

Land Classification: Itogon's land includes forest, timberland, and patented mining claims. Only 9.84% is agriculturally classified, but it's suitable for farming, covering 80% of diverse ecosystems.

Political Boundaries: Defining ancestral territories is complex due to misaligned political boundaries, leading to disputes hindering surveys and certificates.

Ancestral Domains: Royalty issues in Bokod-Itogon contested area are complicated by overlapping domain titles, affecting resource extraction and issue resolution.

Land Laws/Policies: Addressing challenges in Itogon's ancestral domain requires resolving administrative hurdles, updating land use plans, reconciling resource policies, and adhering to LG Code for proper barangay delineation.

With Other Agencies: Challenges in Itogon's ancestral domains include NCIP survey issues, boundary disputes, CADT favoritism,

and limited IPRA budget. NCIP faces timeframes and PRSL system difficulties. DENR acknowledges MGB permits, CADT overlap, and policy harmonization.

Misinterpretations: Varying interpretations of IPRA Section 56 and prior rights on ancestral lands in the Philippines are explored.

Suggestions: Different perspectives on boundary interpretation and conflict resolution stress aligning laws with IPRA, protecting indigenous rights, and balancing interests for present and future generations' well-being.

4.2 Comparative Legal Analysis

Legal systems may share principles, classifications, modes of thought, or organizational structures that extend beyond national borders and are also present in the legal system. Gaining an understanding of the variations among different legal cultures can be instructive. The procedure followed by the researchers, based on Eberle's (2011) Roger Williams University Law Module on Methodological Approaches to Comparative Law, can be summarized as follows: 1) Developing comparative skills, 2) Evaluating external legal systems, 3) Evaluating internal legal systems, and 4) Making comparative observations.

4.2.1 Land Policies and Surveying Procedures Interpretations: (Table 2) *Ancestral Domain Definition:* Itogon's Ancestral Domains were initially considered public, conflicting with IPRA's recognition of them as communally-owned. This arises from national laws and diverse land classifications, leading to conflicting interpretations driven by agency roles.

Surveying Equipment: DENR and NCIP use similar survey equipment, with DENR having more aerial instruments, while Indigenous Peoples rely on written records. Engr. Bangao from NCIP primarily uses GPS, considering drones despite IP concerns, and Forester Nicanor mentions DENR's Total Station and GPS, omitting aerial photogrammetry.

Surveying Methods: Differences in surveying methods have impacted Ancestral Domain delineation. DENR initially lacked aerial tech, while NCIP uses drones and satellite imagery, favoring satellites due to IP concerns. Boundary compromises affect traditions and rituals.

Map Projections: DENR and NCIP in the Philippines use PRS92 but face conflicts due to local cadastral grids. They've developed the DENR-CAR and NCIP-CAR ONE PROJECTION MAP for coordination while awaiting PRS conversion.

Order of Accuracy: DENR and NCIP use the same order of accuracy, following DENR Administrative Order No. 2007-29. DENR Memorandum Circular No. 2010-13 specifies control point types based on ancestral domain size.

Monuments: NCIP Administrative Order No. 1 Series of 2020 provides monument guidelines, emphasizing evidence like pictures and histories. It also specifies monument types and natural landmarks' significance, as recognized in DAO-93-02 and IPRA.

Survey Parties: DENR's DAO-93-02 and IPRA do not specify the survey party composition, but NCIP's Administrative Order No. 1-2020 outlines a team comprising a PDT member, Chief of Party, and community members. Roles include information gathering, technical leadership, and local knowledge.

Pre-Survey: NCIP focuses on assessment, documentation, and validation; DENR emphasizes land identification, and IPRA outlines processes for already delineated domains. There are variations in procedure durations and complexities.

Survey Proper: DENR focuses on aerial surveying, NCIP provides guidelines, and IPRA emphasizes document investigation. Conflicts can cause delays, and the process varies by terrain, involving traditional methods and community participation.

Post-Survey: DENR and NCIP have differing post-survey procedures, with NCIP being more detailed, while IPs have the Ancestral Domain Sustainable Development and Protection Plan (ADSDPP) for future land use. Co-researchers discussed varying estimates and influencing factors.

4.3 Map Overlay Analysis

To provide a visualization of the implications of the differences in survey procedures used by the NCIP, DENR, and Igorots in delineating Ancestral Domains, the researchers used the Ancestral Domain Map of Itogon from its ADSDPP for 2019-2023: Comprehensive Land Use Plan for 2015-2024 and Participatory Mapping with Hon. Pacio and Sir Pocding (Itogon Igorots).
This (Fig 1) shows the overlap and difference between the Itogon Political Boundary established by DENR-NAMRIA (Administrative Boundaries shapefile) in 1900, and Itogon General Ancestral Domains Boundary (georeferenced and vectorized from the ADSDPP).
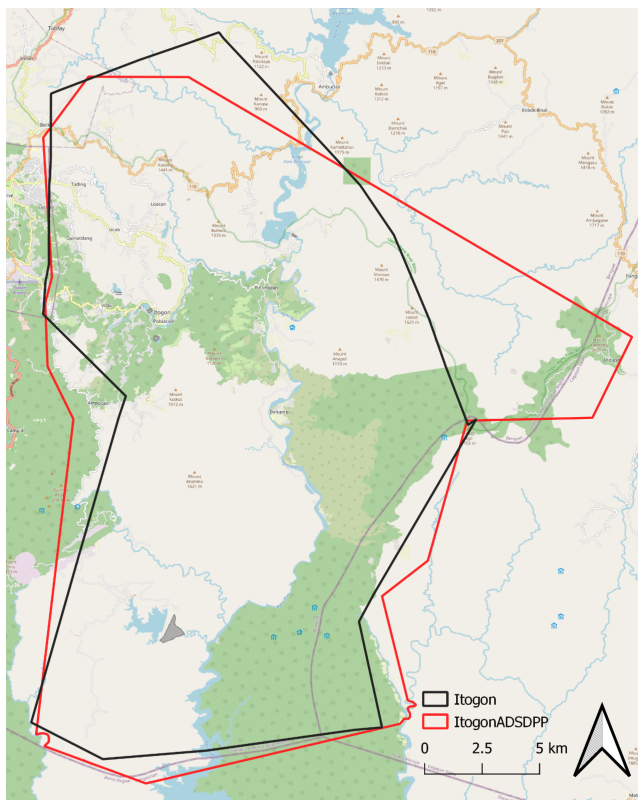

Figure 1. Itogon Political Boundaries According to NAMRIA (Black) and ADSDPP (Red)

CONFLICTING SURVEYING PROCEDURES	GENERAL RECOMMENDATIONS
ANCESTRAL DOMAIN DEFINITION	Clarify IPRA terms: *Time Immemorial, Private Communal Property, Prior Rights*
	Definite Harmonization of Various Jurisdictions of Land Classifications within Ancestral Domains
SURVEYING EQUIPMENT	Use of Aerial Photogrammetric Instruments
	Upgrade Surveying Instruments
SURVEYING METHODS	Prioritization of IPs' Self-delineation over Political Boundary Delineation; In-depth Anthropological fieldwork
	Quick Mapping using 3D participatory mapping in GIS
	Create an Ancestral Domain Code
MAP PROJECTIONS	Updating Reference System/UsingCommon Geodetic Reference : PRS92
ORDER OF ACCURACY	Create Different Section for Ancestral Domain Surveys in the Surveying Manual
MONUMENTS	Align Guidelines for Types of Monuments (Natural and Man-Made Boundaries)
	Standardize of Monument Specifications
SURVEY PARTIES:	Align Guidelines for Survey Party
	Include Elders, IP Organization Leaders, and Anthropology Experts in Ancestral Domain Delineation
PRE-SURVEY	Develop a structured communication channel for DENR and NCIP
	Develop definite guidelines and timelines for pre-survey
	Regular coordination meetings of DENR and NCIP
SURVEY PROPER	Establish a Uniform Area-Duration Guideline for Ancestral Domain Delineation
	Update Ancestral Domain Reference Maps
POST-SURVEY	Create a Post-Survey Section in the Ancestral Domain Surveying Guidelines

Table 2. Conflicting Surveying Procedures and Recommendations

Itogon Political Boundary (Black) from DENR - NAMRIA; Area = 41769.130 ha; Itogon Ancestral Domains General Boundary (Red) from ADSDPP; Area = 49739.202 ha; Itogon Ancestral Domain and Political (Municipality) Boundaries Overlap/Difference; Area = 11015.830 ha

4.3.1 3D GIS Participatory Mapping: The researchers have integrated 3D Model Participatory mapping with GIS (Fig 2&3) to explore the intersecting advantages and benefits they offer to participatory mapping. This combined approach aims to leverage the strengths of both methodologies and further enhance community engagement and decision-making processes. The markers were identified by the researchers and co-researchers as follows:

- Mountain Peaks = pointed white intersection of lines; 3D = High Elevations
- Capillary Rivers/Saddles = Thin brown/green/blue lines; 3D = Mid-Low Elevation
- Main Rivers = Blue/Green thick lines; 3D = Low Elevations
- Dams = Blue/Green thick wide lines; 3D = Low Elevations
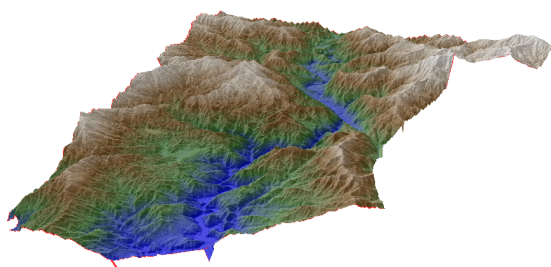- Road Junctions

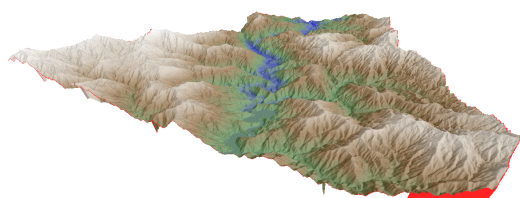**Figure 2.** 3D GIS Itogon General Ancestral Domain - North Perspective

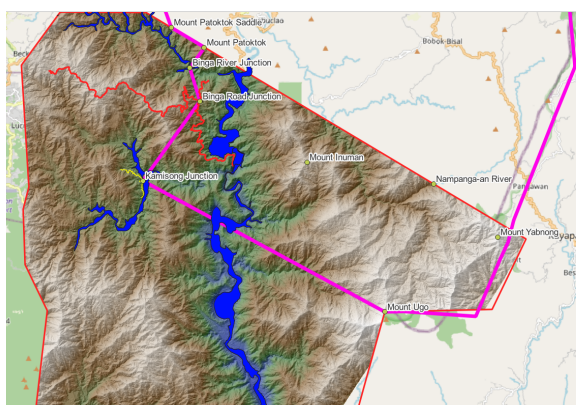
Figure 3. South Perspective

Figure 4. Natural Boundary Markers identified by the Igorots

The neighboring Ancestral Domain in the municipality of Bokod (Fig 5) utilized these natural markers (Fig 4), including some man-made markers like road junctions. According to Hon. Norberto Pacio, this was influenced by the presence of Binga Dam in the area and the associated royalties it brought.

Itogon and Bokod General Ancestral Domains Contested Area = 11937.804 ha; 23.99% of a total area of 497,392,018.360 square meters
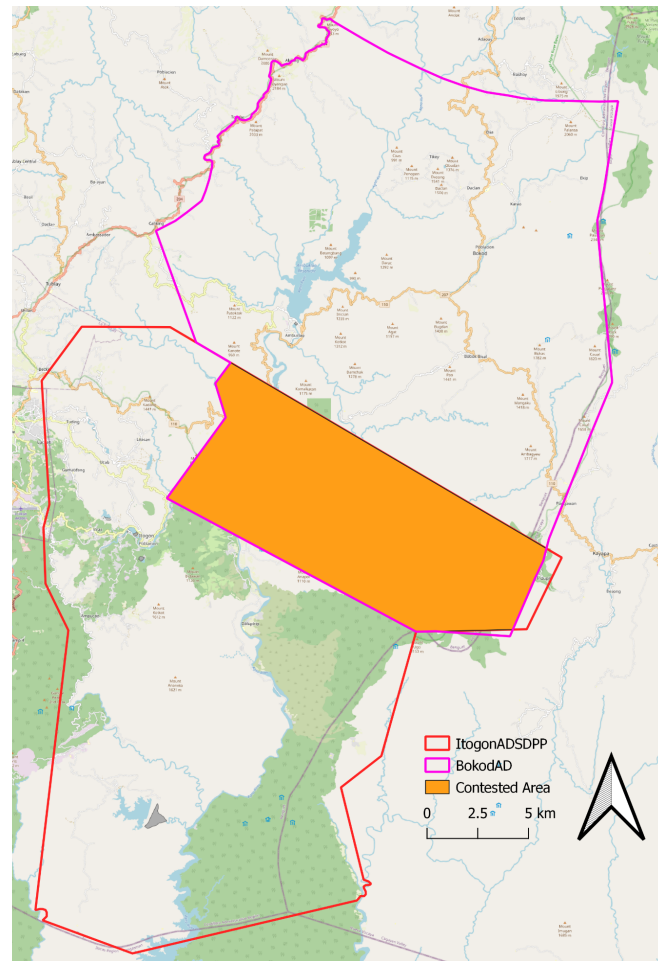

Figure 5. Itogon (Red) and Bokod (Pink) General Ancestral Domains Overlap

4.4 Conflict Land Administration Domain Model (LADM)

The IPA, CLA, and MOA were combined to form a Land Administration Domain Model (LADM). ISO (2012) emphasizes that land tenure includes a social connection to land rights, legally recognized within a jurisdiction. This model illustrates the overlap between Ancestral Domains and Political Boundaries in Itogon.

4.4.1 Itogon Ancestral Domain and Itogon Political Boundaries: The PH_ItogonIP: LA_GroupParty symbolizes the collective representation of the Itogon groups (Itogon IPs and NCIP) advocating for their Itogon_Rights: LA_Rights to own, manage, and develop the Itogon Ancestral Domain. Conversely, the PH_DENR: LA_Party represents the DENR Administration that has already established its rights in the same region ADPB_Overlap: LA_SpatialUnitGroup (Itogon Ancestral Domains: Domolpos Iowak Kalanguya, Itogon Ibaloi Kankanaey,

Ambasa Luzod ADs; Itogon Political Boundaries, and Land Classifications overlap), known as DENR_Rights: LA_Rights. Consequently, this results in the presence of ConflictingParties: LA_GroupParty, which combines both parties and signifies the conflict between them. Without these LA_BAUnits, CADTs and CADCs, these rights for Itogon would not exist.

In order to define their territorial boundaries, Itogon utilizes specific references classified under Itogon_referencesType, including the ADSDPP, Participatory Mapping, IPRA, and NAO 2020-01. On the other hand, DENR refers to DAO 1993-02 and 2007-29. These references, or LA_SpatialSource, play a crucial role in validating their respective territorial limits (Fig 6).
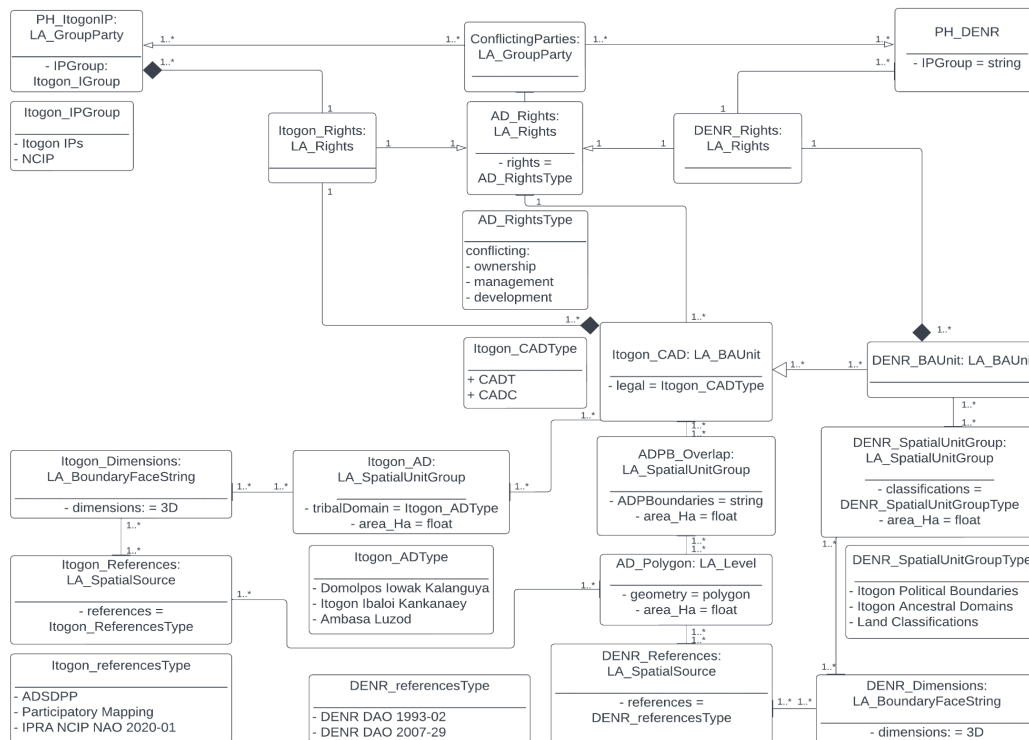

Figure 6. Itogon Ancestral Domains and Itogon Political Boundary Conflict LADM
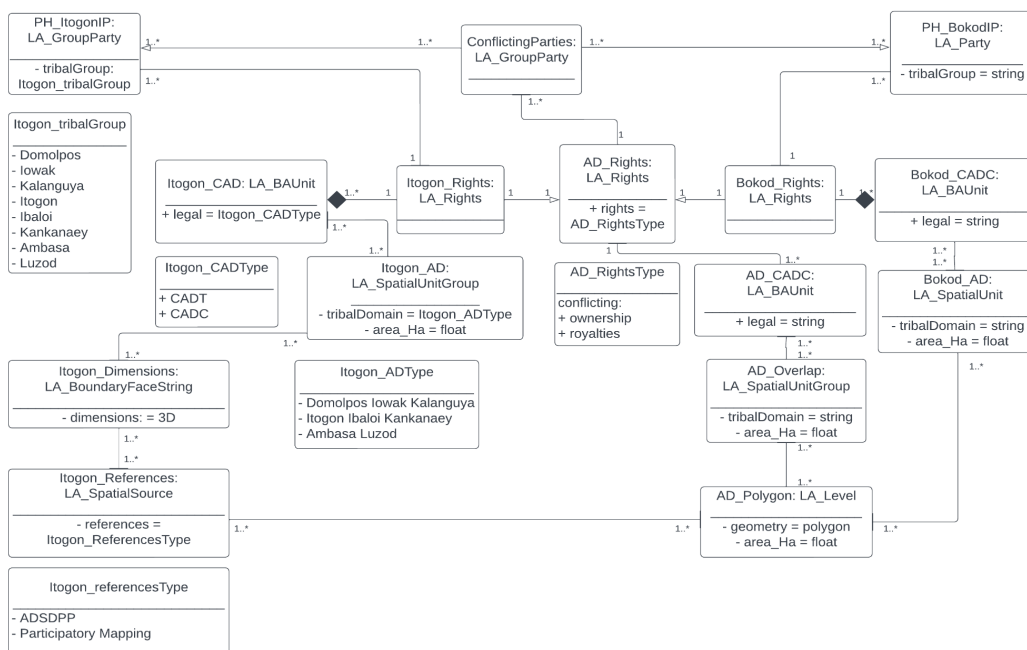

Figure 7. Itogon and Bokod Ancestral Domains Conflict LADM

4.4.2 Itogon and Bokod Ancestral Domains: PH_ItogonIP: LA_GroupParty represents the different tribes (Domolpos, Iowak, Kalanguya, Itogon, Ibaloi, Kankanaey, Ambasa, Luzod) that consider their Ancestral Domains as part of Itogon as a whole while PH_BokodIP: LA_Party is the generalized Bokod IP that claims parts of the Itogon Ancestral Domains, hence, the existence of ConflictingParties:LA_GroupParty which is the combination of the two parties. Although it is expected that their LA_Rights should be distinct, they contend for the same type of rights (ownership and royalties) in the same LA_SpatialUnitGroup or the AD_Overlap, resulting in a conflict between them. The existence of these rights is contingent upon the parties possessing Certificates of Ancestral Domain Titles/Claims, which fall under the LA_BAUnit category. Without these certificates, the rights in question would not be recognized. To establish their boundary, Itogon relies on specific references categorized under Itogon_referencesType, namely the ADSDPP and Participatory Mapping. These references or LA_SpatialSource serves as the basis for validating their territorial limits (Fig 7).

5. SUMMARY AND CONCLUSION

IPA unveiled three central themes related to Ancestral Domain boundaries: the definition of domains, overlaps, and conflicts involving different agencies. These themes shed light on issues such as resource development, tax disputes, land classifications, and ownership complexities in Itogon. Additionally, CLA uncovered conflicts in mapping boundaries for Igorots, NCIP, and DENR due to differing land classifications and legal interpretations. Proposed solutions include the use of drones and precise definitions to safeguard ancestral lands. Indigenous Peoples predominantly rely on a qualitative mapping approach, which underscores the introduction of 3D Participatory Mapping. These findings, summarized in the Conflict LADM, reveal the intricacies of mapping Igorot Ancestral Domains, emphasizing the urgent need for policy harmonization, clearly defined boundaries, and diverse input. MOA outlines contested areas in Itogon, offering valuable insights for future land delineation and facilitating survey procedure harmonization among Igorots, NCIP, and DENR by identifying commonalities and areas that require improvement.

6. RECOMMENDATIONS

The researchers aimed to create a reference for future research that can be utilized for revising survey manuals, updating AD Sustainable Development and Protection Plans, and making legal amendments. Standardizing 3D GIS participatory mapping in diverse terrains within ancestral domains is essential for accurate mapping. Collaboration among departments and agencies, such as LRA, NAMRIA, LMB, DAR, and RD by strengthening their Joint Administrative Orders (JAO), is vital for recognizing and safeguarding ancestral domains. This study should serve as a reference for future land management decisions in the Philippines to promote sustainable development, protect ancestral domains, and respect indigenous rights.

REFERENCES

Albano, W., 2022. Who are the Igorot? https://www.publicpeople.org/who-are-the-igorot.htm. (June 2023).

Bautista, L., 2011. Philippine territorial boundaries: internal tensions, colonial baggage, ambivalent conformity. https://core.ac.uk/download/pdf/37020236.pdf. (June 2023).

De Vera, D., Claps, L.M., 2017. Participatory 3D-Mapping Supports Ancestral Domain Claims. Case Study of the ILC Database of Good Practices. Rome: ILC. https://d3o3cb4w253x5q.cloudfront.net/media/documents/ilc_case_study_0003_philippines_en_0.pdf. (June 2023).

Eberle, E., 2011. The Methodology of Comparative Law. https://docs.rwu.edu/cgi/viewcontent.cgi?article=1445&context=rwu_LR#:~:text=The%20essence%20of%20comparative%20law,law%2C%20more%20than%20written%20words. (June 2023).

International Organization for Standardization, 2012. NEN-EN-ISO 19152: Geographic Information - Land Administration Domain Model (LADM). https://www.iso.org/standard/51206.html. (June 2023).

Itogon Government, n.d.. Chronology of Itogon History. https://itogon.gov.ph/index.php/general-information/history. (June 2023).

Molintas, J., 2004. The Philippine Indigenous People's Struggle For Land and Life: Challenging Legal Texts. http://arizonajournal.org. (June 2023).

National Mapping and Resource Information Authority, 2016. Modernization of the Philippine Reference System. https://www.namria.gov.ph/jdownloads/Others/StratPlan_Modernization.pdf. (June 2023).

Prill-Brett, J., 2007. Contested Domains: The Indigenous Peoples Rights Act (IPRA) and Legal Pluralism in the Northern Philippines. https://commission-on-legal-pluralism.com/system/commission-on-legal-pluralism/volumes/55/prillbrett-art.pdf. (June 2023).

Sarmiento, B. S., 2012. Mining firm, not tribesmen, to blame for atrocities in Tampakan. Mindanews. http://www.mindanews.com/top-stories/2012/07/01/mining-firm-nottribesmen-to-blame-for-atrocities-in-tampakan/. (June 2023).

Smith, J., Osborn, M., 2007. Interpretative Phenomenological Analysis.http://www.sagepub.com/sites/default/files/upm-binaries/17418_04_Smith_2e_Ch_04.pdf. (June 2023).

United States Geological Survey, 2022. Aerial Photographs and Satellite Images: Online Edition. https://pubs.usgs.gov/gip/AerialPhotos_SatImages/aerial.html. (June 2023).