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Modernizing Land Administration in Cameroon: Challenges, Geodetic Inconsistencies, and the Path Toward a Fit-for-Purpose Cadastral Reform

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Abstract

Land administration in Cameroon remains fragmented by overlapping statutory and customary tenure regimes, unreconciled legacy geodetic datums, and limited digital infrastructure, producing persistent boundary disputes, weak tenure security, and constrained investment in land and natural resources. While the fit-for-purpose land administration paradigm and technologies such as Global Navigation Satellite Systems, Continuously Operating Reference Stations and Unmanned Aerial Vehicles have transformed cadastral practice elsewhere in Africa, no integrated framework has yet reconciled Cameroon's geodetic inconsistencies, legal constraints and cadastral fragmentation within a single reform pathway. This paper develops such a framework through a systematic literature review of sixty-five English- and French-language sources retrieved from Web of Science, Google Scholar and African Journals Online between 2000 and 2026, supplemented by grey literature and analysed using PRALSMA, a generative artificial intelligence-assisted extension of PRISMA. Evidence was synthesised around four objectives: diagnosing existing reference-system and institutional gaps; formulating a national GNSS/CORS densification and UAV mapping strategy; designing inclusive tools for recording customary and informal rights; and drafting a phased legislative and institutional roadmap. The review situates Cameroon's challenges within wider debates on fit-for-purpose land administration, geodetic reference infrastructure, artificial intelligence-driven cadastral systems, and land tenure security across Sub-Saharan Africa, revealing a persistent disconnect between the technical, legal and social dimensions of reform. The resulting framework offers surveying professionals, land administrators and policymakers an evidence-based, incrementally implementable pathway toward accurate, inclusive and legally robust cadastral modernisation in Cameroon and comparable bilingual, dual-tenure jurisdictions.

1. Background

Secure, accurate and up-to-date land administration systems are widely recognised as foundational infrastructure for sustainable development, underpinning tenure security, land-based investment, taxation, dispute resolution and effective natural resource governance (Williamson et al., 2010; Bennett et al., 2012). In response to the persistent gap between the comprehensive, survey-accurate cadastres advocated by conventional land administration theory and the resource constraints of many developing countries, Enemark et al. (2014, 2016) proposed the fit-for-purpose land administration approach, which prioritises flexible spatial frameworks, incremental accuracy improvement and inclusive recognition of the full continuum of land rights over rigid, survey-grade precision. The fit-for-purpose paradigm has since been operationalised across Sub-Saharan Africa through geospatial technologies such as Unmanned Aerial Vehicles for rapid, low-cost boundary mapping (Stöcker et al., 2017) and through the reform of urban cadastral toolboxes, as demonstrated in Ethiopia by Alemie et al. (2015).

Where land administration systems remain fragmented or legally ambiguous, the consequences extend well beyond technical inefficiency. Weak or contested land records have been linked to large-scale land acquisitions and elite capture of the rule of law across Sub-Saharan Africa (German et al., 2013), to procedural and distributional injustices in land deals in Ghana (Ahmed et al., 2019), and, more broadly, to

an expanding body of scholarship problematising land acquisition as a structural governance failure rather than an isolated transactional phenomenon (Liao and Agrawal, 2024). Conversely, empirical evidence from Malawi shows that strengthening land tenure security has a measurable, positive effect on smallholder investment in soil and water conservation, underscoring the developmental stakes of reliable cadastral and tenure information (Mkandawire et al., 2025).

Cameroon exemplifies these challenges in an especially acute form. Land governance operates under a dual system in which statutory land ordinances formally vest ownership of unregistered land in the State as part of the national domain, while the overwhelming majority of rural and peri-urban land continues to be held, transacted and inherited under customary arrangements that receive little formal legal protection (Assembe-Mvondo et al., 2014). This legal ambiguity, compounded by an overburdened and slow land registration bureaucracy, has fuelled a persistent rise in land-related litigation, with courts increasingly called upon to adjudicate disputes that formal land administration institutions have failed to prevent or resolve (Enoh, 2025). Layered onto these legal and institutional weaknesses are significant technical deficiencies: Cameroon's cadastral surveys still rely on multiple, poorly reconciled legacy geodetic datums inherited from the colonial and immediate post-independence periods, in the near-total absence of a national Continuously Operating Reference Station network of the kind promoted continent-wide under the African Geodetic Reference Frame initiative (Wonnacott, 2006). The resulting positional inconsistencies between historic and newly surveyed parcels undermine boundary certainty, complicate the integration of cadastral data into national spatial data infrastructure, and raise the cost and duration of land registration and dispute resolution.

At the same time, advances in satellite positioning, low-cost Unmanned Aerial Vehicle photogrammetry, standardised land administration data models such as the Land Administration Domain Model (Lemmen et al., 2015), and artificial intelligence-assisted land administration systems (Hosseini et al., 2025) now offer technically and financially feasible pathways to modernise cadastral infrastructure even in resource-constrained settings. Yet these technical, legal and social strands of reform have rarely been synthesised into a single, context-specific framework for Cameroon. Existing national policy responses have tended to treat geodetic modernisation, legal reform and the recognition of customary rights as separate, sequential problems rather than as interdependent components of one reform agenda.

This fragmentation motivates the present study, which aims to develop an integrated, fit-for-purpose framework to modernise Cameroon's land administration by jointly addressing its geodetic inconsistencies, legal constraints and cadastral fragmentation. Four objectives operationalise this aim: (a) diagnose existing reference systems, data gaps and institutional overlaps hindering accurate cadastral mapping; (b) formulate a strategy for deploying a national GNSS/CORS network that harmonises geodetic datasets and enables high-resolution UAV mapping; (c) design inclusive tools for recording customary and informal land rights, allowing incremental upgrading toward full statutory recognition; and (d) draft a phased legislative and institutional roadmap that updates land laws, standardises processes and builds local geomatics expertise. These four objectives structure both the evidence synthesis in Section 4 and the discussion in Section 5.

The remainder of this article is organised as follows. Section 2 reviews the literature on land administration, geodetic infrastructure and cadastral modernisation and identifies the theoretical gaps that this study addresses. Section 3 sets out the research methodology, including the PRALSMA-extended systematic review protocol illustrated in Fig. 1, the database-specific Boolean search strategy, the artificial intelligence-assisted extraction prompts, and the six-dimension quality appraisal reported in Table I. Section 4 presents the results: Section 4.1 profiles the appraised evidence base as a whole (Table II), and Sections 4.2 to 4.5 address Objectives 1 to 4 in turn, each supported by a dedicated evidence table (Tables III to VI respectively). In Section 5 ,the findings in relation to the wider peer-reviewed and grey literature and sets out the study's theoretical and practical contributions are discussed. Section 6 concludes with a summary of the study's contributions, limitations and directions for future research.

2. Literature Review

2.1 Land Administration, Cadastral Modernisation and Geodetic Infrastructure: A Global and African Perspective

Land administration theory has evolved considerably over the past two decades, moving away from a narrow conception of the cadastre as a purely fiscal or legal record towards a broader understanding of land administration systems as spatial, legal and institutional infrastructure for sustainable development (Williamson et al., 2010). Bennett et al. (2012) argue that organising land information around flexible, extensible spatial units, rather than rigid parcel-based models alone, better supports the diversity of tenure arrangements found in developing contexts. Building on this, Enemark et al. (2014) and Enemark et al. (2016) formalised the fit-for-purpose land administration approach around three guiding principles: flexibility in spatial and legal accuracy, inclusiveness of all people and all land rights, and incremental, upgradeable implementation. This approach has become the dominant reference framework guiding land administration reform across Africa, including in the specific technical and legal domains examined in this study.

A recurring technical constraint within this literature is the quality of the underlying geodetic reference infrastructure. Accurate cadastral mapping presupposes a coherent national geodetic reference frame to which all surveys, historical and contemporary, can be consistently related. Continent-wide, this need has been addressed through the African Geodetic Reference Frame initiative, which seeks to densify Global Navigation Satellite System control across Africa and integrate national datums into a common, internationally compatible reference system (Wonnacott, 2006). Where Continuously Operating Reference Station networks have been established, they have been shown to substantially improve the speed, cost and precision of real-time kinematic surveying compared with conventional static or terrestrial methods, although their implementation across the continent remains uneven and is frequently constrained by funding, technical capacity and inter-agency coordination. Cameroon's

continued reliance on multiple unreconciled legacy datums, without a functioning national Continuously Operating Reference Station network, places it behind several comparator countries in this respect.

Unmanned Aerial Vehicles and associated photogrammetric workflows have emerged as a complementary technology for rapid, fit-for-purpose boundary mapping. Stöcker et al. (2017) review the regulatory and technical state of Unmanned Aerial Vehicle deployment for land administration purposes, noting that while image acquisition has become inexpensive and accessible, deriving legally defensible cadastral boundaries from imagery still requires careful attention to ground control, flight planning and boundary delineation protocols. Earlier applied work by Manyoky et al. (2012) demonstrated the feasibility of Unmanned Aerial Vehicle-based cadastral mapping in Rwanda, reporting accuracies compatible with fit-for-purpose requirements at a fraction of the cost of conventional aerial or terrestrial survey. Taken together, this literature suggests that Unmanned Aerial Vehicle mapping, if properly integrated with ground control tied to a reliable geodetic reference frame, offers a technically viable route to accelerating cadastral coverage in data-sparse jurisdictions such as Cameroon.

Recording the customary and informal rights that dominate land holding in much of rural Africa requires data models and tools capable of representing the full continuum of tenure, rather than only formally registered ownership. The Land Administration Domain Model, an International Organization for Standardization-registered conceptual model, provides a common schema for representing parties, rights, restrictions, responsibilities and spatial units across both statutory and customary regimes (Lemmen et al., 2015). Operationally, the Social Tenure Domain Model was developed as a pro-poor, low-cost extension of this thinking, enabling the participatory recording of social tenure relationships that fall outside conventional title registration (UN-Habitat and GLTN, 2010). Evidence from urban cadastral reform in Ethiopia indicates that adapting such tools to local institutional contexts, rather than importing standardised cadastral toolboxes wholesale, is critical to their success in strengthening urban land governance (Alemie et al., 2015).

A more recent strand of literature examines the role of artificial intelligence in land administration. Early work by Abanda et al. (2011) proposed an ontology-driven decision support system to improve the transparency and consistency of land delivery processes in Zambia, anticipating more recent developments in this area. Hosseini et al.(2025) provide a systematic account of research challenges and applications in artificial intelligence-driven land administration, identifying automated boundary extraction, intelligent data integration and decision support as priority application areas, while cautioning that data quality, algorithmic transparency and institutional readiness remain significant barriers to adoption in low-resource settings. More broadly, generative artificial intelligence tools are increasingly being explored as instruments for evidence synthesis and planning support in African urban and land contexts (Abanda et al., 2026), a development directly relevant to the artificial intelligence-assisted review methodology adopted in this study.

A parallel body of literature situates cadastral and geodetic weaknesses within the wider political economy of land governance in Sub-Saharan Africa. German et al. (2013) show that large-scale land

acquisitions frequently exploit legal deficiencies and weak enforcement rather than being purely a function of land scarcity, while Ahmed et al.(2019) demonstrate, through case studies in Ghana, that the procedural fairness of land transactions is often as consequential for affected communities as their distributional outcomes. Liao and Agrawal (2024) synthesise two decades of this scholarship, arguing for a more systematic, comparative science of land acquisition that moves beyond isolated case studies. This literature collectively underscores that improving the technical accuracy of cadastral records, while necessary, is not on its own sufficient to secure tenure or prevent dispossession unless accompanied by robust legal and institutional safeguards.

Within Cameroon specifically, the literature is dominated by legal and institutional analyses rather than technical or geospatial studies. Assembe-Mvondo et al. (2014) provide a detailed re-examination of the legal status of national lands, arguing that the formal vesting of unregistered land in the State has been interpreted and applied inconsistently, creating persistent uncertainty for customary landholders, investors and public agencies alike. More recently, Enoh (2025) documents the scale and character of land-related litigation in Cameroonian courts, attributing much of this litigation to the absence of reliable, harmonised cadastral records capable of definitively establishing boundaries and ownership. Neither study, however, engages substantively with the geodetic and technological dimensions of the problem, revealing a disciplinary divide between legal and technical scholarship on Cameroonian land administration that this study seeks to bridge.

2.2 Theoretical Gaps in Current Literature

Read together, this literature reveals four related gaps that justify the present study. First, the fit-for-purpose land administration literature is theoretically well developed but has rarely been operationalised as an integrated, country-specific framework that simultaneously addresses geodetic infrastructure, mapping technology, inclusive tenure recording and legislative reform; most studies isolate one or two of these dimensions rather than treating them as interdependent (Enemark et al., 2014; Bennett et al., 2012). Second, the substantial literature on Continuously Operating Reference Station networks and Unmanned Aerial Vehicle-based mapping in Africa is largely technical in orientation and pays limited attention to how these tools intersect with customary tenure recognition and legal reform processes on the ground (Wonnacott, 2006; Stöcker et al., 2017).

Third, the Cameroon-specific literature is almost exclusively legal and institutional in focus (Assembe-Mvondo et al., 2014; Enoh, 2025), leaving the country's geodetic inconsistencies and cadastral fragmentation comparatively under-examined despite their evident contribution to the disputes this legal literature documents. Fourth, while artificial intelligence-driven approaches to land administration and to evidence synthesis are gaining traction internationally (Hosseini et al., 2025; Abanda et al., 2026), their application to systematic literature review methodology itself, and to Francophone and bilingual African contexts specifically, remains largely unexplored. Collectively, these gaps indicate the absence of an integrated, evidence-based framework that reconciles the technical (geodetic and mapping), legal and social (customary tenure) dimensions of land administration reform for Cameroon, which this study addresses through the aim and objectives set out in Section 1.

3. Research Methods

3.1 Research Design and Systematic Review Protocol

This study adopts a systematic literature review (SLR) methodology, valued for its structured, transparent and replicable approach to synthesising existing research (Snyder, 2019). The review follows the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework, organising the process into four stages: identification, screening, eligibility and inclusion.

Recognising the growing use of generative artificial intelligence (GenAI) in research workflows, the study proposes PRALSMA (PRISMA for AI-Assisted Literature Synthesis), an extension of the PRISMA protocol illustrated in Fig. 1. As Fig. 1 shows, PRALSMA augments the conventional PRISMA stages with six explicit procedures: AI tool selection and justification; prompt engineering and documentation; AI-assisted evidence extraction; human validation and expert oversight; cross-tool triangulation; and transparent reporting of AI contributions. PRALSMA does not replace PRISMA but complements it, keeping AI-assisted synthesis accountable and human-centred, consistent with Abanda et al. (2026).

3.1.1 Literature Search Strategy

The search was conducted across three bibliographic sources: Web of Science (WoS), Google Scholar and African Journals Online (AJOL). This multi-database strategy reflects the geographic and linguistic focus of the review on Cameroon. Reliance on WoS alone would risk underrepresenting regionally published African scholarship: Asubiaro and Onaolapo (2023) found that only 7.4 per cent of active African journals are indexed in WoS and 7.8 per cent in Scopus, out of over 2,200 identified titles, while Alonso-Álvarez (2024) documents persistent geographic and linguistic bias in mainstream bibliographic databases. Google Scholar was therefore included for its broader disciplinary and geographic coverage, and AJOL for its specific coverage of African-published research, in line with the recommendations of Haddaway et al. (2015) and Asubiaro (2023).

3.1.2 Search Period and Justification

The review covers publications from 2000 to 2026. The year 2000 was chosen to capture the shift from conventional cadastral record-keeping toward digital land information infrastructure and integrated land management (Williamson et al., 2010; Bennett et al., 2012), the growing application of GIS, GNSS, remote sensing and UAV-based mapping to cadastral systems (Enemark et al., 2014; Stöcker et al., 2017), and the emergence of the fit-for-purpose land administration paradigm (Enemark et al., 2014, 2016), while still admitting foundational studies of the technical, geodetic and institutional problems that preceded recent reforms and shaped the contemporary challenges diagnosed in Section 4.2.

3.1.3 Boolean Search Strings and Database-Specific Adaptations

Each database was queried with a three-part Boolean structure combining land administration terminology, a Cameroon-specific geographic filter, and a technical or reform-related qualifier. The exact strings, adapted to each platform's syntax constraints, were as follows.

Web of Science (WoS) single combined string:

("land administration" OR cadastre OR cadastral OR "cadastral system*" OR "land registration" OR "land information system*" OR "land record*" OR "property registration" OR "land tenure" OR "land governance") AND (Cameroon OR Cameroun OR Cameroonian) AND (challenge* OR constraint* OR problem* OR weakness* OR inconsisten* OR fragment* OR reform* OR moderni* OR digit* OR geodetic OR geodesy OR "reference system*" OR "reference frame*" OR datum OR GNSS OR CORS OR UAV OR drone* OR GIS OR geomatics OR "fit-for-purpose" OR "fit for purpose" OR STDM OR "Social Tenure Domain Model" OR "participatory mapping")

This string returned 12 articles, all in English.

Google Scholar because the platform performs poorly with long Boolean strings (Gusenbauer and Haddaway, 2020), the WoS string was split into shorter, concept-focused English block then also translated to French to ensure comprehensive coverage of Cameroon's bilingual scholarly output.

English block: ("land administration" OR cadastre OR cadastral OR "land registration" OR "land governance" OR "land tenure security" OR "land title") AND (Cameroon OR Cameroun) AND (modernization OR reform OR digitization OR geodetic OR GNSS OR CORS OR GIS OR UAV OR drone)

French block: ("administration foncière" OR cadastre OR cadastral OR "immatriculation foncière" OR "gouvernance foncière" OR "sécurité foncière" OR "titre foncier") AND (Cameroun OR Cameroon) AND (modernisation OR réforme OR numérisation OR géodésique OR GNSS OR CORS OR SIG OR UAV OR drone)

The English block retrieved 33 relevant articles (screened from the top eight pages of 80 results) and the French block retrieved 6 relevant articles (screened from the top five pages of 50 results), a Google Scholar subtotal of 39.

African Journals Online (AJOL) searches were run separately in English and French using shorter concept blocks appropriate to AJOL's simpler query interface.

English block: 8 results screened, 0 relevant after duplicate/full-text screening. French block: 2 results screened, 1 relevant. AJOL therefore contributed 1 article (French). Combining all three databases: WoS (12) + Google Scholar (39) + AJOL (1) = 52 peer-reviewed articles (45 in English, 7 in French). An additional 13 grey-literature items - technical reports, policy briefs, working papers and thematic literature reviews produced by international organisations, land-governance programmes and national institutions were identified through targeted searches of organisational repositories (IIED, LandCam/CED, RELUFA, ISELDA, Gates Open Research, YARA) using the same English/French keyword

logic, and were added following the same relevance screening described in Section 3.1.4. This brought the final unit of analysis to 65 sources.

3.1.4 Screening and Inclusion Process

Screening followed the PRISMA flow shown in Fig. 1. Records were assessed against inclusion criteria on the basis of title, abstract and full-text review. Two records identified during initial screening, dated 1998 and 1999, fell outside the 2000–2026 window and were excluded to preserve chronological consistency. After removing these records and duplicate entries, the remaining records were screened for relevance to the study's aim and objectives (Section 1), yielding the final dataset of 52 peer-reviewed articles and 13 grey-literature items, appraised in full in Table I.

3.1.5 AI-Assisted Analysis and Validation Aligned with Study Objectives

The 65 sources were imported into ChatGPT Project and Google NotebookLM to support data extraction and thematic analysis. Prompt 1 established the shared corpus and extraction ground rules: "Ingest the 65 appraised sources provided, confirm access to the full text, language and citation metadata of each, and treat every subsequent extraction as strictly evidence-bound to these sources do not draw on outside knowledge." Extraction then proceeded through four objective-specific prompts, each requiring inline citations traceable to a specific source and page or section:

Prompt 2 (Objective 1): "Critically read the manuscripts and list all documented challenges related to geodetic reference systems, data inconsistencies, institutional fragmentation, and overlapping mandates in Cameroon's land administration, with clickable inline citations for verification."

Prompt 3 (Objective 2): "Critically read the manuscripts and identify all technological innovations, case studies, and deployment strategies for GNSS, CORS, and UAVs in land administration contexts, particularly those applicable to data-scarce or resource-constrained environments, with clickable inline citations."

Prompt 4 (Objective 3): "Critically read the manuscripts and list all participatory mapping tools, Social Tenure Domain Model (STDM) applications, and fit-for-purpose approaches that have been used to document customary, informal, or undocumented land rights, with clickable inline citations for each item."

Prompt 5 (Objective 4): "Critically read the manuscripts and synthesize all recommendations, policy frameworks, and capacity-building strategies for reforming land laws, standardizing procedures, and developing local geomatics expertise, with clickable inline citations."

Because NotebookLM anchors outputs to source documents through inline citations, a feature unavailable in ChatGPT, Prompts 2 to 5 were each re-issued to ChatGPT as Prompts 6 to 9 respectively, with an added instruction: "For every claim, return the exact supporting passage, the in-text citation in

author-year format, and the complete reference-list entry for the source; do not paraphrase without also quoting the underlying sentence." This adaptation ensured transparency, reproducibility and traceability while reducing hallucination risk, consistent with PRALSMA's cross-tool triangulation step (Fig. 1).

All AI-generated outputs were manually verified, appraised and triangulated against the original sources. The authors independently reviewed each extracted claim, resolving discrepancies through joint re-reading of the source text; AI tools were confined to extraction and organisation, with synthesis, coding and interpretation led throughout by the authors. Findings extracted under Prompts 2, 3, 4 and 5 (and their ChatGPT counterparts, Prompts 6 to 9) map directly onto Sections 4.2, 4.3, 4.4 and 4.5 respectively.

3.1.6 Theoretical Framework

The analysis is guided by an integrative framework combining creativity-in-design, relational agency and democratic planning. GenAI is positioned as a socio-technical actor supporting problem-solution co-evolution and scenario exploration within the research process, while human-AI collaboration requires alignment with expert judgement rather than automation for its own sake (Raisch and Krakowski, 2021). Digital governance research further emphasises participatory, inclusive planning processes (Cardullo et al., 2019), framing GenAI as a tool that must be deployed transparently and under continuous human oversight, principles directly relevant to the inclusive dimensions of fit-for-purpose land administration pursued in this study.

3.2 Quality Appraisal and Evidence Weighting

A structured quality appraisal was conducted for all 65 included sources, following established quality-appraisal principles for systematic literature reviews (Snyder, 2019). Each source was assessed across six dimensions: study type (empirical, conceptual, case-based or policy-oriented); methodological transparency, based on the clarity of research design, data collection and analytical procedures; evaluation maturity, rated as validated, partially validated or emerging; geographic relevance, rated as direct (explicitly focused on Cameroon), transferable (comparable African or global contexts) or limited; validation rigor, examined through sample size, triangulation, peer-review status and consistency of findings; and language and interpretability, with French- and English-language sources appraised in their original language by fluent bilingual reviewers. No source was downgraded solely for being in French; translational challenges in rendering terms such as immatriculation foncière, titrage, concession and usage coutumier were noted and checked against the original text where relevant.

3.2.1 Classification Tiers

Based on these six dimensions, sources were classified into three tiers. High-tier sources are empirically validated, methodologically robust, geographically relevant and clearly interpretable within the bilingual context; they are prioritised in the synthesis. Moderate-tier sources are partially validated, with methodological or contextual limitations that require corroboration from higher-tier evidence. Emerging-tier sources are conceptual or have limited validation and are treated as indicative rather than conclusive.

3.2.2 Appraisal Process

The 13 grey-literature items including LandCam programme reviews commissioned through the Centre pour l'Environnement et le Développement (CED), the International Institute for Environment and Development (IIED) and RELUFA (e.g. Kenfack et al., 2018; Natali, 2018; Bassalang and Acworth, 2020a, 2020b; Seigneret et al., 2021), an ISELDA policy brief on socio-economic land data (Ayamena, 2020), a Gates Open Research brief on land registration (Javelle, 2018), a YARA Institute working paper on legal pluralism (Tchatchoua-Djomo, 2021), and a thematic literature review on tenure-security assumptions (Hillenbrand et al., 2025) were independently appraised against the same six dimensions rather than assumed high quality by default; eleven of the thirteen were rated high and two moderate to emerging, reflecting variation in methodological transparency between programme evaluations with documented fieldwork and shorter policy briefs.

The 52 peer-reviewed articles, 45 in English and 7 in French were independently appraised by the two authors, both fluent in English and French. Each source was assessed against the six dimensions, with disagreements resolved through joint discussion and re-examination of the original passages, particularly regarding study-type classification and validation rigor. No inter-coder reliability statistic was calculated; however, the joint-resolution process ensured disagreements were addressed substantively.

3.2.3 Reporting and Transparency

The final classification of all 65 sources is summarised in Table I, reporting each source's citation, language, study type, evaluation maturity and geographic relevance. This transparent reporting allows readers to assess the evidentiary basis for each claim made in Section 4 and supports the reproducibility of the review, consistent with PRALSMA's principles of traceability and human oversight (Fig. 1).

Table I. Quality appraisal summary of all 65 sources included in the review.

Source (citation)	Language	Study type	Evaluation tier	Geographic relevance
Ahidjo (2012)	English	Conceptual	Moderate	Direct
Bassalang and Acworth (2020a)	English	Case-based	High	Direct
Bassalang and Acworth (2020b)	French	Case-based	High	Direct
Hillenbrand et al. (2025)	English	Review	High	Transferable
Javelle (2018)	English	Policy-oriented	Moderate	Direct
Kenfack et al. (2018)	French	Case-based	High	Direct
Natali (2018)	English/French	Case-based	High	Direct
Ayamena (2020)	English	Policy-oriented	Moderate	Direct
Naburo and Munju (2006)	English	Conceptual	Emerging	Direct
RELUFA (2012)	English	Policy-oriented	Moderate	Direct
Seigneret et al. (2021a)	English	Policy-oriented	High	Direct
Tchatchoua-Djomo (2021)	English	Empirical	High	Direct
Verhegghen et al. (2021)	English	Empirical	High	Direct
Abanda et al. (2011)	English	Empirical	High	Transferable
Ahmed et al. (2019)	English	Case-based	High	Transferable
Akenji and Neba (2025)	English	Empirical	Moderate	Direct
Alemie et al. (2015)	English	Case-based	High	Transferable
Anonymous (2026)	English	Case-based	Emerging	Direct
Assako Assako (2012)	French	Case-based	Moderate	Direct
Assembe-Mvondo et al. (2014)	English	Review	High	Direct
Awoh (2026)	English	Empirical	High	Direct
Bachange and Tchawa (n.d.)	English	Review	Moderate	Direct
Bah and Dossa (2025)	English	Review	High	Transferable
Bah and Kenmegne (2025)	English	Review	High	Direct

Source (citation)	Language	Study type	Evaluation tier	Geographic relevance
Bitondo and Bakoumé (2022)	English	Conceptual	Moderate	Direct
Byamugisha and Dubosse (2023)	English	Empirical	High	Transferable
Ekei and Epie (2025)	English	Conceptual	Moderate	Direct
Ngondi and Engolo (2024)	French	Conceptual	Moderate	Direct
Enoh (2025)	English	Conceptual	Moderate	Direct
Pamen et al. (2021)	English	Empirical	Moderate	Direct
German et al. (2013)	English	Review	High	Transferable
Hosseini et al. (2025)	English	Review	High	Transferable
Essougong and Teguia (2019)	English	Review	High	Direct
Kenjio (2020)	English	Review	Moderate	Transferable
Kometa and Asongsaigha (2019)	English	Empirical	Moderate	Direct
Liao and Agrawal (2024)	English	Review	High	Transferable
Mondoleba (2026)	French	Conceptual	Moderate	Direct
Maluh et al. (2024)	English	Empirical	High	Direct
Fube et al.(2018)	English	Case-based	Moderate	Direct
Mbarga Mbarga et al. (2021)	English	Empirical	High	Direct
Mbira and Arrey (2024)	English	Empirical	High	Direct
Menguena (2025)	English	Case-based	High	Direct
Baye (2008)	English	Case-based	High	Direct
Pondie et al. (2025)	English	Empirical	High	Direct
Mevoa et al. (2015)	French	Empirical	Moderate	Direct
Minfede Koe (2020)	English	Empirical	High	Direct
Mkandawire et al. (2025)	English	Empirical	High	Transferable
Mpessa (2004)	French	Conceptual	Moderate	Direct
Ndam (2021)	French	Empirical	Moderate	Direct

Source (citation)	Language	Study type	Evaluation tier	Geographic relevance
Ndam et al. (2023)	French	Empirical	Moderate	Direct
Ndi et al.(2021)	English	Empirical	High	Direct
Nformi et al. (2023)	English	Empirical	High	Direct
Fils et al. (2018)	English	Empirical	High	Direct
Njoh (2000)	English	Review	Moderate	Direct
Njoh (2010)	English	Case-based	High	Direct
Njoh (2013)	English	Review	High	Direct
Njoh et al. (2018)	English	Empirical	High	Direct
Ndo and Kenfack (2026)	English	Empirical	High	Direct
Orock (2005)	English	Case-based	Moderate	Direct
Saha (2024)	English	Empirical	High	Direct
Sugathadasa and Hemachandra (2026)	English	Review	High	Transferable
Sunjo and Page (2022)	English	Empirical	High	Direct
Tafon and Saunders (2018)	English	Empirical	High	Direct
Kamdem and Ndeffo (2026)	English	Empirical	High	Direct
Tulone et al. (2022)	English	Empirical	High	Transferable

4. Research Results

The findings are organised into five sections. Section 4.1 profiles the appraised evidence base as a whole; Sections 4.2 to 4.5 then present the substantive findings aligned with the study's four objectives and Tables III–VI, moving from the diagnosis of existing weaknesses, to the geodetic and UAV mapping strategy, to inclusive tools for customary and informal rights, and finally to the phased legislative and institutional roadmap.

4.1 Overview and Appraisal Profile of the Evidence Base

Before presenting the substantive findings, it is useful to characterise the corpus from which they are drawn. Of the 65 sources appraised in Table I, 52 (80 per cent) are peer-reviewed journal articles and 13 (20 per cent) are grey literature; 55 sources are in English, 9 in French and 1 LandCam report is available bilingually. Fifty-two sources (80 per cent) are rated as having direct geographic relevance to Cameroon, while 13 (20 per cent) are transferable comparative studies from Ethiopia, Ghana, Zambia, Malawi and

other African or global contexts, used to benchmark Cameroon's experience against comparable reform trajectories. By study type, empirical studies with primary data collection or spatial analysis form the largest group (27 sources, 42 per cent), followed by reviews (13, 20 per cent), case-based studies (13, 20 per cent), conceptual or legal-doctrinal analyses (8, 12 per cent) and policy-oriented reports (4, 6 per cent). Table II summarises this profile and cross-references it against the evaluation-maturity tiers established in Section 3.2.1.

The appraisal profile in Table II confirms two patterns anticipated in Section 2.2. First, the Cameroon-specific literature is weighted toward legal, institutional and socio-economic case studies (Assembe-Mvondo et al., 2014; Njoh, 2013; Enoh, 2025; Ekei and Epie, 2025) rather than technical geodetic or geospatial studies, of which only a small cluster directly addresses reference systems, GNSS/CORS infrastructure or UAV mapping (Mbarga Mbarga et al., 2021; Menguena, 2025; Fils et al., 2018; Naburo and Munju, 2006). Second, the corpus is skewed toward high- and moderate-tier sources (41 and 22 respectively), with only two sources both narrowly scoped grey-literature or conference items on geomatics capacity-building, rated emerging; this suggests that, while thin in technical coverage, the corpus is not thin in evidentiary quality, lending reasonable confidence to the synthesis that follows.

Table II. Appraisal profile of the 65 sources reviewed, by source type, language, geographic relevance, study type and evaluation tier.

Dimension	Category	n (%) of 65	Representative sources
Source type	Peer-reviewed journal articles	52 (80%)	Ahmed et (2019); Njoh et al. (2018); Essougong and Teguia (2019)
	Grey literature (reports, briefs, working papers)	13 (20%)	Natali (2018); Javelle (2018); Tchatchoua-Djomo (2021)
Language	English	55 (85%)	Assembe-Mvondo et al. (2014); Enoh (2025)
	French	9 (14%)	Mpessa (2004); Ngondi and Engolo (2024)
	Bilingual (English/French)	1 (2%)	Natali (2018)
Geographic relevance	Direct (Cameroon-focused)	52 (80%)	Mbarga Mbarga et al. (2021); Njoh (2013); Saha (2024)
	Transferable (comparable African/global contexts)	13 (20%)	Alemie et al. (2015); Mkandawire et al. (2025)
Study type	Empirical	27 (42%)	Kamdem and Ndeffo (2026); Fils et al. (2018)
	Review	13 (20%)	Essougong and Teguia (2019); Bah and Kenmegne (2025)
	Case-based	13 (20%)	Baye (2008); Sunjo and Page (2022)
	Conceptual / legal-doctrinal	8 (12%)	Ekei and Epie (2025); Mpessa (2004)
	Policy-oriented	4 (6%)	Ayamena (2020); RELUFA (2012)
Evaluation tier	High	41 (63%)	Assembe-Mvondo et al. (2014); Mbarga Mbarga et al. (2021); Seigneret et al. (2021a)
	Moderate	22 (34%)	Kometa and Asongsaigha (2019); Mevoa et al. (2015)
	Emerging	2 (3%)	Naburo and Munju (2006); Anonymous (2026)

4.2 Diagnosis of Existing Reference Systems, Data Gaps and Institutional Overlaps

The appraised evidence converges on seven interlocking diagnostic findings, summarised with their supporting evidence and citations in Table III.

First, Cameroon's cadastral surveys remain tied to multiple, poorly reconciled legacy geodetic datums inherited from the German, French and British colonial administrations, with no operational national

Continuously Operating Reference Station (CORS) network of the kind promoted under the African Geodetic Reference Frame initiative (Wonnacott, 2006). Menguena (2025) documents the Ministry of State Property, Surveys and Land Tenure's own acknowledgement of this problem in its Réseau Géodésique National initiative, launched to replace "heterogeneous" reference networks inherited from previous regimes, while Mbarga Mbarga et al. (2021) show empirically, using UAV-derived geospatial data in an informal settlement in Yaoundé, that the absence of a coherent reference framework directly obstructs land-rights regularisation on the ground.

Second, the dual statutory–customary tenure system produces persistent record ambiguity rather than a single, unambiguous cadastral truth. Assembe-Mvondo et al. (2014) show that the statutory vesting of unregistered land in the State has been applied inconsistently across administrations, while Ekei and Epie (2025) and Essougong and Teguia (2019) confirm that statutory and customary systems continue to function as parallel, weakly reconciled regimes, leaving the practical security of the majority of rural landholders dependent on local custom rather than registered title.

Third, institutional mandates for land administration are fragmented across ministries, technical services and consultative bodies whose coordination is weak. Mbira and Arrey (2024) document the limited and contested peacemaking role of the Land Consultative Board in resolving disputes that fall between formal judicial and customary channels, and Koe (2020) provides direct empirical evidence drawn from an efficiency analysis of Cameroon's own land-tenure-services modernisation programme that procedural bottlenecks and low technical efficiency persist despite two decades of reform investment.

Fourth, socio-economic and spatial data on land remain fragmented and difficult to cross-reference. Ayamena (2020) finds that Cameroon's socio-economic land data are dispersed across incompatible administrative databases with limited cross-matching capacity, while Javelle (2018) reports that, even after the 2005 simplification reform, less than two per cent of land in Cameroon was formally registered or titled in the early 2000s, a data gap that later empirical work (Fils et al., 2018; Kometa and Asongsaigha, 2019) shows has continued to constrain both urban planning and rural tenure security; Akenji and Neba (2025) trace this same data gap through to substandard housing outcomes in Bamenda, evidencing its downstream welfare cost.

Fifth, urban land-use planning is itself hampered by uncoordinated monitoring data, as rapid, poorly monitored land-use change in Mamfe (Maluh et al., 2024) echoes earlier, similarly uncoordinated urban embellishment efforts in Yaoundé (Assako Assako, 2012).

Sixth, weak records leave Cameroon exposed to elite capture and land-grabbing risk: large-scale acquisitions typically exploit legal deficiency rather than genuine land scarcity (German et al., 2013), a structural, continent-wide dynamic (Tulone et al., 2022; Liao and Agrawal, 2024) that Tafon and Saunders (2018) document directly in Cameroon through the contested (trans)nationalisation of resistance to land deals.

Seventh, these weaknesses translate directly into unresolved conflict: rising litigation (Enoh, 2025), complicated colonial-era land restitution (Sunjo and Page, 2022), and encroachment on the Ottotomo forest reserve (Saha, 2024). Hillenbrand et al. (2025) add a global caveat that mapping and registration interventions do not automatically deliver the tenure security they are often assumed to provide, a caveat the roadmap in Section 4.5 takes seriously. Collectively, these seven findings establish that Cameroon's cadastral weaknesses are not a single technical deficit but an interlocking set of geodetic, legal, institutional and data problems that any modernisation framework must address jointly rather than sequentially.

Table III. Diagnosed reference-system, data and institutional gaps (Objective 1).

Diagnosed issue	Description	Key evidence	Tier
Legacy geodetic datum fragmentation; no operational national CORS network	Multiple unreconciled colonial-era datums remain in use; no continuous national GNSS reference backbone exists to unify historical and new surveys.	Wonnacott (2006); Menguena (2025); Mbarga Mbarga et al. (2021); Naburo and Munju (2006)	High
Dual statutory–customary record ambiguity	Statutory vesting of unregistered land in the State is applied inconsistently; customary and statutory registers function as parallel, weakly reconciled systems.	Assembe-Mvondo et al. (2014); Ekei and Epie (2025); Essougong and Teguia (2019); Ahidjo (2012); Mpessa (2004)	High
Institutional mandate overlap and low technical efficiency	Land agencies, technical services and consultative bodies (e.g. the Land Consultative Board) have overlapping, weakly coordinated mandates and documented procedural inefficiency.	Mbira and Arrey (2024); Koe (2020); Nformi et al. (2023)	High
Fragmented socio-economic and spatial data; low registration coverage and substandard housing outcomes	Land-related administrative data are dispersed across incompatible databases; formal titling has historically covered a very small share of parcels, with knock-on effects on housing quality.	Ayamena (2020); Javelle (2018); Fils et al. (2018); Kometa and Asongsaigha (2019); Akenji and Neba (2025)	Moderate
Uncoordinated urban land-use planning and monitoring data	Rapid, poorly monitored urban expansion outpaces the data and planning tools available to municipal authorities, particularly in secondary towns.	Maluh et al. (2024); Assako Assako (2012); Bah and Kenmegne (2025); Anonymous (2026)	Moderate
Elite capture and land-grabbing vulnerability arising from weak records	Legal deficiency and weak enforcement, rather than land scarcity alone, enable large-scale acquisitions and contested (trans)national resistance where cadastral records are unreliable.	German et al. (2013); Tafon and Saunders (2018); Tulone et al. (2022); Liao and Agrawal (2024); Ahmed et al. (2019)	High
Unresolved conflict, litigation and untested formalisation assumptions	Weak, ambiguous records fuel rising litigation, complicate land restitution, and enable encroachment on protected and community land; the wider literature cautions that mapping and titling do not automatically deliver the tenure security often assumed.	Enoh (2025); Sunjo and Page (2022); Saha (2024); Hillenbrand et al. (2025); Ngondi and Engolo (2024)	High

4.3 Strategy for Deploying a National GNSS/CORS Network and Enabling UAV-Based High-Resolution Mapping

Building on this diagnosis, the appraised technical literature points to a phased, hybrid strategy combining a densified national GNSS/CORS backbone with UAV-based fit-for-purpose mapping,

summarised in Table IV.

At the reference-infrastructure level, Cameroon's needs align closely with the African Geodetic Reference Frame agenda (Wonnacott, 2006): a national network of permanently operating GNSS reference stations, integrated into regional African densification, would provide the coherent geodetic backbone that Menguena (2025) shows is currently missing from the Réseau Géodésique National effort. Regionally comparable CORS deployments elsewhere in Africa demonstrate that such networks substantially reduce the cost, time and error of real-time kinematic surveying relative to conventional terrestrial methods, directly addressing the positional-inconsistency problem identified in Section 4.2.

At the mapping level, the evidence supports UAV photogrammetry as a fit-for-purpose complement rather than a substitute for CORS infrastructure. Mbarga Mbarga et al. (2021) provide direct Cameroonian evidence that UAV-collected geospatial data can support land-rights regularisation in informal settlements at a fraction of conventional survey cost, provided boundary delineation is tied to reliable ground control. Fils et al. (2018) further show that satellite and remote-sensing imagery already used to monitor land-surface change in Douala could be extended into systematic cadastral base-mapping, while Verhegghen et al. (2021) demonstrate, through the LandCam/CED earth-observation initiative, that democratised access to satellite imagery can improve the transparency of land-use governance when paired with local capacity to interpret it. Earlier GIS-based urban reorganisation exercises in Mbalmayo (Mevoa et al., 2015) and Yaoundé (Assako Assako, 2012) confirm that geospatial tools have already been used successfully, if unevenly, in Cameroonian urban planning practice, providing an institutional foothold for scaling UAV-based cadastral mapping.

Capacity remains a binding constraint. Naburo and Munju (2006), reporting on the EReT Cameroon initiative's engagement with international MSc programmes in geoinformatics, show that local technical capacity-building has long been recognised as necessary but has not been sustained at the scale required to operate and maintain a national CORS/UAV mapping programme, reinforcing the case for the capacity-building component of the roadmap developed in Section 4.5.

Table IV. Recommended national GNSS/CORS and UAV mapping strategy (Objective 2).

Strategy component	Recommended approach	Supporting evidence	Indicative phase
National GNSS/CORS backbone	Densify permanent GNSS reference stations and integrate them into the continental African Geodetic Reference Frame.	Wonnacott (2006); Menguena (2025)	Foundational
UAV fit-for-purpose boundary mapping	Deploy UAV photogrammetry tied to reliable ground control to regularise land rights in informal and peri-urban settlements.	Mbarga Mbarga et al. (2021); Manyoky et al. (2012)	Early
Satellite and remote-sensing base layers	Extend existing land-surface and earth-observation monitoring into systematic cadastral base-mapping and transparency tools.	Fils et al. (2018); Verhegghen et al. (2021)	Early–Mid
GIS-enabled urban planning integration	Scale up existing municipal GIS practice already used for urban reorganisation into cadastral workflows.	Mevoa et al. (2015); Assako Assako (2012); Maluh et al. (2024)	Mid
AI-assisted decision support and data integration	Layer ontology-driven decision-support and AI-based data-integration tools onto GNSS/UAV outputs to automate boundary extraction and flag inconsistencies.	Hosseini et al. (2025); Abanda et al. (2011)	Mid
Digitised, evidence-based titling workflows	Redesign title-registration workflows around the global systematic-review evidence on what makes titling durable, adapting comparable urban cadastral toolbox reforms and the low registration baseline documented for Cameroon.	Sugathadasa and Hemachandra (2026); Javelle (2018); Alemie et al. (2015)	Mid–Late
Local geomatics capacity-building	Sustain international partnerships and MSc-level geoinformatics training pipelines to operate and maintain GNSS/UAV infrastructure.	Naburo and Munju (2006)	Continuous

4.4 Inclusive Tools for Recording Customary and Informal Land Rights

The third objective concerns tools capable of recording the customary and informal rights that dominate landholding outside Cameroon's cities, summarised in Table V.

The LandCam programme reviews provide the most direct evidence base for this objective. Natali (2018) and Bassalang and Acworth (2020a, 2020b) document a range of community-level initiatives in Northern and Southern Cameroon such as participatory community mapping, negotiated boundary agreements and locally validated land registers that have improved the legibility of customary rights without requiring immediate full statutory titling, while Kenfack et al. (2018) show that accountability and legal-framework weaknesses continue to limit how far such locally recognised rights translate into durable legal

protection. Seigneret et al. (2021) synthesise six years of this LandCam experience, concluding that inclusive recognition tools are most durable when they combine community-based mapping with sustained legal and policy advocacy rather than technical mapping alone.

Evidence on the social legitimacy of customary institutions reinforces this conclusion. Ndi et al. (2021) show that traditional authorities and local elites can act either as protectors or as enablers of land dispossession depending on how their role is institutionally embedded, while Awoh (2026) demonstrates in Kom and Bali that conflict-mediation legitimacy depends on transparent, locally accountable processes rather than on formal recognition alone. Baye (2008) and Tchatchoua-Djomo (2021) further show, respectively through village-level case evidence and a wider review of legal pluralism, that informal and customary institutions continue to mediate the practical security of access to land even where statutory law formally displaces them, implying that any inclusive recording tool must be built to interoperate with, rather than override, these institutions.

Gender-differentiated access is a recurring and largely unresolved theme. Njoh et al. (2018) show that institutional, economic and socio-cultural factors combine to disadvantage women in formal land-title procurement, a finding corroborated by Pamen et al. (2021) on gender-based access and wellbeing and by Ndam et al. (2023) on women's access to land ownership in Baïgom. Bachange and Tchawa (n.d.) argue that land tenure reforms which are not explicitly gender-sensitive risk reproducing food insecurity among women farmers even as they formalise land rights more broadly, underscoring that inclusive tools must be evaluated not only by their technical reach but by their distributional effects.

Table V. Inclusive tools for recording customary and informal land rights (Objective 3).

Tool / approach	Description	Target group	Evidence
Participatory community mapping and negotiated boundaries	Community-validated mapping of customary boundaries without requiring immediate full statutory titling.	Rural and peri-urban customary communities	Natali (2018); Bassalang and Acworth (2020a, 2020b)
Locally validated registers linked to legal advocacy	Community land registers combined with sustained legal and policy advocacy for durable protection.	Communities pursuing incremental statutory recognition	Kenfack et al. (2018); Seigneret et al. (2021a)
Traditional-authority-mediated conflict resolution	Transparent, locally accountable mediation processes engaging chiefs and local elites as protectors rather than enablers of dispossession.	Contested customary and foreign-investment-adjacent land	Ndi et al. (2021); Awoh (2026)
Legal-pluralism-sensitive registration protocols	Recording tools designed to interoperate with customary and migrant tenure norms rather than override them.	Migrant, indigene-settler and pluralistic tenure contexts	Tchatchoua-Djomo (2021); Baye (2008); Orock (2005)
Northern Cameroon customary systems as a design reference	Documented local land-ownership and access systems in Northern Cameroon provide a template for adapting recording tools to pastoral and agro-pastoral tenure norms.	Pastoral and agro-pastoral communities, Northern Cameroon	Ahidjo (2012); Natali (2018)
Gender-responsive land access mechanisms	Deliberate correction of institutional, economic and socio-cultural barriers that disadvantage women in land title procurement.	Women landholders and farmers	Njoh et al. (2018); Pamen et al. (2021); Ndam et al. (2023); Bachange and Tchawa (n.d.)
Locally decentralised institutional anchors	Embedding recording tools within decentralised local institutions (municipal and university-linked land offices) to sustain community-level uptake.	Decentralising municipalities and peri-urban growth poles	Fube et al. (2018)

4.5 Phased Legislative and Institutional Roadmap

The final objective synthesises the preceding findings into a phased roadmap for legislative and institutional reform, set out in Table VI.

Historical analysis shows that Cameroonian land policy has evolved through successive, largely incremental adjustments rather than comprehensive reform (Njoh, 2000), and that earlier formalisation efforts have had uneven equity outcomes across regions and social groups (Njoh, 2013). This suggests that a further round of purely incremental adjustment is unlikely to resolve the interlocking problems identified in Section 4.2; a phased but structurally coherent reform pathway is required instead.

Comparative evidence from French-speaking Africa supports this reading: Bah and Dossa (2025) find that community land governance reforms across the region succeed when legal and institutional change is sequenced deliberately rather than pursued piecemeal, a conclusion echoed by Kenjio (2020) in his broader review of decolonising land tenure reform pathways across Sub-Saharan Africa.

Institutional evidence indicates where sequencing should begin. Bitondo and Bakoumé (2022) find only partial integration of sustainable land management principles into Cameroon's development strategies and policies, implying that early-phase reform should focus on aligning land administration objectives with existing national planning instruments before pursuing new legislation. RELUFA (2012) documents overlapping natural-resource permits and land-use conflicts arising directly from this weak alignment, reinforcing the priority of institutional coordination. Mondoleba (2026) shows that unresolved land conflict is taking increasingly monetised and confrontational forms in contemporary Cameroon, adding urgency to this sequencing.

Later-phase reform is supported by digital and financial evidence. Ndo and Kenfack (2026) demonstrate that information and communication technologies can materially reduce land-transaction insecurity and conflict in the Cameroonian context, providing a digital-governance foundation for the legislative updates envisaged once geodetic and institutional foundations are in place. Byamugisha and Dubosse (2023) provide a Sub-Saharan African cost–benefit case for prioritising land tenure security investment, while Kamdem and Ndeffo (2026) show, using Cameroonian household data, that each incremental step up the tenure-security ladder, from informal occupation to customary right to formal title is associated with a measurable increase in household land investment, providing a direct economic rationale for the roadmap's incremental, upgradable design.

Table VI. Phased legislative and institutional roadmap (Objective 4).

Phase	Indicative timeframe	Priority actions	Supporting rationale
Phase 1 – Foundational alignment	Years 1–2	Align land administration objectives with national development planning; begin GNSS/CORS network design; strengthen inter-agency coordination.	Bitondo and Bakoumé (2022); RELUFA (2012); Menguena (2025); Pondie et al. (2025); Mondoleba (2026)
Phase 2 – Early implementation	Years 2–4	Pilot UAV mapping in informal settlements; formalise community-based recognition tools; draft initial legislative amendments; digitise title-registration workflows.	Mbarga Mbarga et al. (2021); Natali (2018); Bah and Dossa (2025); Sugathadasa and Hemachandra (2026)
Phase 3 – Scale-up	Years 4–7	Densify national CORS coverage; roll out ICT-enabled land-transaction systems; institutionalise geomatics capacity-building and AI-assisted data integration.	Ndo and Kenfack (2026); Naburo and Munju (2006); Byamugisha and Dubosse (2023); Hosseini et al. (2025)
Phase 4 – Consolidation	Years 7+	Complete legislative harmonisation of statutory and customary provisions; institute monitoring and evaluation of tenure-security outcomes; embed reforms within decentralised institutions.	Njoh (2000); Njoh (2013); Kenjio (2020); Kamdem and Ndeffo (2026); Fube et al.(2018); Mkandawire et al. (2025)

5. Discussion of Findings

5.1 Appraisal of Results in Relation to Existing Literature, Including Grey Literature

The results in Section 4 both confirm and extend the theoretical gaps identified in Section 2.2. Consistent with the global fit-for-purpose literature (Enemark et al., 2014, 2016; Bennett et al., 2012), the evidence shows that Cameroon's problems are multi-dimensional rather than purely technical, spanning the seven interlocking issues catalogued in Table III; but where the academic literature on Cameroon has concentrated on legal and institutional analysis (Assembe-Mvondo et al., 2014; Njoh, 2013; Enoh, 2025; Ekei and Epie, 2025), the present review shows that this legal picture cannot be fully understood without the corroborating operational detail supplied by grey literature. It is the LandCam programme reviews (Natali, 2018; Bassalang and Acworth, 2020a, 2020b; Kenfack et al., 2018; Seigneret et al., 2021), the ISELDA policy brief on socio-economic land data (Ayamena, 2020) and the Gates Open Research brief on land registration (Javelle, 2018), rather than the peer-reviewed record alone that supply the ground-level, practitioner-generated evidence on how customary recognition tools actually function, how registration data are actually managed, and how far formal titling has actually progressed. Excluding this evidence, as a peer-review-only search strategy would have done, would have understated both the scale of the

registration gap (fewer than two per cent of parcels titled by the early 2000s, per Javelle, 2018) and the extent to which community-based recognition tools already operate as a de facto layer of Cameroon's land administration system, alongside rather than instead of the statutory framework.

This pattern echoes a broader methodological finding of the review itself: the same geographic and linguistic biases in mainstream databases documented by Asubiaro and Onaolapo (2023) and Alonso-Álvarez (2024), which justified extending the search beyond Web of Science, also apply to grey literature. Programme and policy documents produced by African-based organisations — the Centre pour l'Environnement et le Développement (CED), RELUFA, IIED's LandCam partnership and the ISELDA network are rarely indexed in academic databases at all, yet Table I shows that eleven of the thirteen grey-literature sources appraised here were rated high tier, on a par with the peer-reviewed evidence, and Table II confirms that this thirteen-item grey-literature stratum is drawn overwhelmingly (80 per cent) from sources with direct Cameroonian relevance. Discounting this evidence a priori, as reviews confined to journal databases often do, would therefore have introduced exactly the kind of representational bias that a Cameroon-focused, bilingual review is designed to avoid.

Where the review's findings diverge from prior literature is in the relative weight attached to technical geodetic infrastructure. The Cameroon-specific peer-reviewed literature has paid limited attention to reference systems and CORS infrastructure (Section 2.2); the present synthesis, by explicitly seeking out this thin but real technical cluster (Menguena, 2025; Mbarga Mbarga et al., 2021; Fils et al., 2018; Naburo and Munju, 2006) and reading it against the continental AFREF literature (Wonnacott, 2006), shows that geodetic modernisation is not merely an unaddressed technical afterthought but an active, if under-resourced, institutional priority already partially underway through the Ministry of State Property, Surveys and Land Tenure's own Réseau Géodésique National initiative (Menguena, 2025). This suggests that the disciplinary divide identified in Section 2.2 is beginning to narrow in policy practice, even where it persists in the published academic literature.

5.2 Theoretical Contributions

The study makes three theoretical contributions. First, it operationalises the fit-for-purpose land administration paradigm (Enemark et al., 2014, 2016) as an integrated, country-specific framework that treats geodetic infrastructure, mapping technology, inclusive tenure recording and legislative reform as interdependent components rather than isolated interventions, addressing the fragmentation identified across the reviewed literature (Section 2.2; Table III). Second, it extends the literature on artificial intelligence in land administration (Hosseini et al., 2025; Abanda et al., 2011, 2026) from technical cadastral applications to the domain of evidence synthesis itself, through the PRALSMA extension of PRISMA, demonstrating a transparent, human-validated protocol for AI-assisted review in a bilingual, data-sparse research environment, a methodological contribution with relevance beyond land administration. Third, by systematically incorporating grey literature alongside peer-reviewed sources and appraising both against the same six-dimension framework, the study offers a replicable model for synthesising evidence in African policy domains where practitioner and programme literature carries a

disproportionate share of the operationally relevant evidence, addressing the representational bias documented by Asubiaro (2023) and Haddaway et al. (2015).

5.3 Practical and Policy Implications

For Cameroon's land administration authorities, three implications follow directly from the findings. First, the diagnosis in Section 4.2 (Table III) indicates that continued investment in registration processing without addressing the underlying geodetic reference infrastructure is unlikely to resolve boundary disputes or reduce litigation (Enoh, 2025; Koe, 2020); the strategy in Section 4.3 (Table IV) therefore recommends sequencing a national GNSS/CORS densification programme, aligned with the African Geodetic Reference Frame, ahead of or alongside further UAV-based mapping expansion. Second, the evidence in Section 4.4 (Table V) indicates that inclusive recording tools succeed when they build on, rather than bypass, existing community-based and LandCam-tested mechanisms (Natali, 2018; Bassalang and Acworth, 2020a, 2020b; Seigneret et al., 2021), suggesting that national-scale roll-out should adapt and formalise these locally validated approaches rather than import untested external toolboxes. Third, the roadmap in Section 4.5 (Table VI) implies that legislative reform will be most effective where it follows, rather than precedes, institutional alignment and geodetic modernisation, consistent with the sequencing logic documented in comparable French-speaking African contexts (Bah and Dossa, 2025).

For surveying and geomatics professionals, the findings underscore a persistent capacity gap (Naburo and Munju, 2006) that will constrain implementation of any technically sound strategy unless addressed through sustained investment in local training, echoing the roadmap's fourth objective. For policymakers and development partners, the cost–benefit and household-investment evidence (Byamugisha and Dubosse, 2023; Kamdem and Ndeffo, 2026) provides a quantifiable economic rationale for prioritising land tenure security investment within Cameroon's wider development planning, including its Emerging Vision 2035 agenda.

6. Conclusions

This paper set out to develop an integrated, fit-for-purpose framework for modernising Cameroon's land administration by jointly addressing geodetic inconsistencies, legal constraints and cadastral fragmentation. Using a systematic literature review of 65 English- and French-language sources, screened through the PRALSMA-extended PRISMA protocol (Fig. 1) and appraised through a structured six-dimension quality framework (Table I), the study characterised the evidence base (Table II), diagnosed the interlocking geodetic, legal, institutional and data weaknesses underlying Cameroon's land administration challenges (Table III), formulated a phased GNSS/CORS and UAV mapping strategy (Table IV), identified inclusive tools for recording customary and informal rights (Table V), and drafted a sequenced legislative and institutional roadmap (Table VI).

The evidence base itself is a finding: eighty per cent of the appraised sources address Cameroon directly and were rated high or moderate quality, but the corpus remains technically thin, with only a small cluster

of studies engaging substantively with geodetic reference infrastructure. Grey literature — LandCam programme reviews, ISELDA and Gates Open Research briefs, and thematic literature reviews — proved indispensable in filling this gap, supplying operational detail on registration coverage, institutional practice and community-based recognition mechanisms that the peer-reviewed record alone does not capture. Any future evidence synthesis on Cameroonian, or more broadly Sub-Saharan African, land administration should therefore treat grey literature as a primary rather than supplementary evidence source.

The resulting framework offers surveying professionals, land administrators and policymakers an evidence-based, incrementally implementable pathway: sequencing geodetic and institutional foundations ahead of legislative reform, building inclusive recording tools on locally validated community mechanisms rather than imported toolboxes, and pairing technical investment with sustained local capacity-building. Because Cameroon combines bilingual scholarship, dual statutory–customary tenure and a still-emerging geodetic infrastructure, the framework and the review methodology that produced it should be transferable, with appropriate contextual adaptation, to other Francophone and Anglophone African jurisdictions facing comparable reform challenges.

The study has limitations that qualify these conclusions. The review is bounded by the search strategy and time period defined in Section 3.1, and while every effort was made to include regionally published and grey literature, some locally circulated Cameroonian sources may remain outside the three databases searched. The AI-assisted extraction protocol, although subject to full human verification, introduces a methodological dependency that future replications should test against fully manual extraction. Finally, because the proposed framework is derived from secondary evidence synthesis rather than primary fieldwork, its practical validation through pilot GNSS/CORS deployment, UAV mapping trials and community-based rights-recording exercises in selected Cameroonian regions remains an important direction for future research.

Declarations

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Author Contribution

All Authors reviewed the manuscript

Data Availability

Data AvailabilityLand and cadastral Data in Cameroon are not totally available. No official CORS system is fonctionning and the actual Geodetic system does not cover the whole country.Land regulations are outdate since 1970 s and not adapt to the ongoing need of the populations.We generated Figure 1 using PRALSMA system.

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Figures

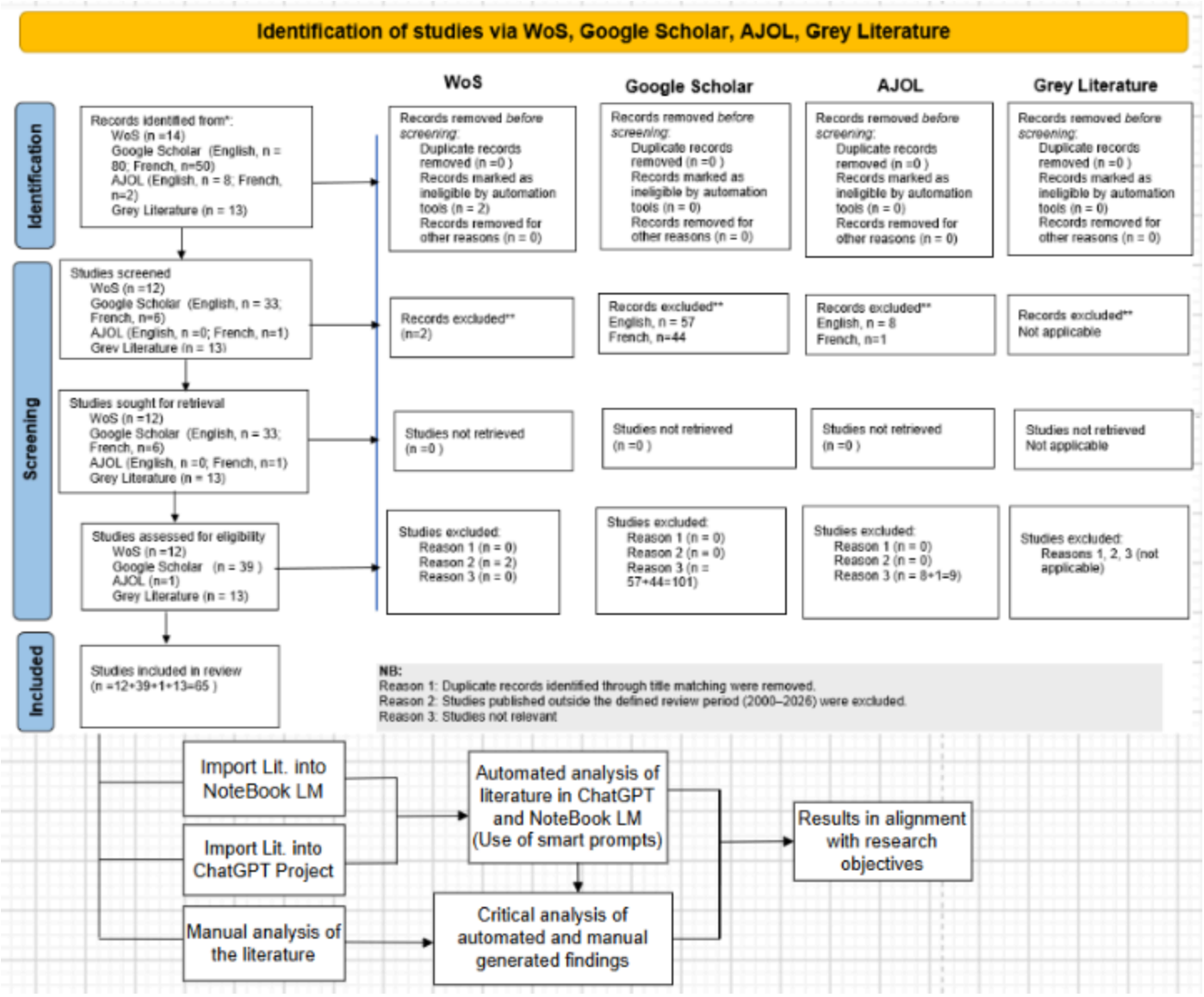


Figure 1

PRISMA/PRALSMA study-identification and evidence-synthesis flow diagram, covering peer-reviewed identification via Web of Science, Google Scholar and AJOL, and grey-literature identification, through to AI-assisted extraction and human validation. Source: Authors' own work.