sustainability

MDPI

Article

Indigenous Knowledge Systems, a Critical Element in Sustainable Rural Development in Africa: Insights from Spatial Planning and Environmental Practices in Meta, Cameroon

Ambe J. Njoh

School of Geosciences, University of South Florida, Tampa, FL, 33620, USA; njoh@usf.edu

Abstract

The study examined indigenous ethos and practices relating to spatial planning and environmental stewardship in Meta, Cameroon. It uses a qualitative case study approach, drawing on archival sources, secondary data, colonial-era records, current literature, observational insights, and long-term contextual familiarity. The analysis draws theoretical inspiration from Indigenous Knowledge Systems, Political Ecology, and Resilience Theory. It affirms that many features of Meta's indigenous physical structures, spatial configurations, agriculture, and environmental practices reflect a sophisticated understanding of sustainability and resilience. It identifies and analyzes specific initiatives imposed by exogenous forces, particularly colonial and post-colonial authorities, to supplant Meta's indigenous ethos in human settlement and environmental planning. Finally, it highlights how Meta communities have used indigenous knowledge and local resources to adapt their settlements and other aspects of their livelihoods to ever-changing socio-economic and political environments. Its most significant scholarly contribution is its addition of knowledge on geopolitically-specific indigenous spatial practices to the ongoing discourse on rural planning and sustainability in Africa.

Keywords: indigenous knowledge; spatial systems; rural settlements; sustainability; Cameroon; Meta; resilience; planning

1. Introduction

Sustainable human settlements and spatial systems have recently become central issues in global development discourse. This is partly due to climate change, rapid urbanization, and uneven infrastructure distribution. Concerned parties have focused almost exclusively on urban areas and, with the exception of a few [1], have neglected rural regions despite their continual transformation and key role in regional sustainability efforts [1]. Alongside this neglect, researchers also tend to privilege formal, technocratic Western knowledge systems over Indigenous Knowledge (IK) as a legitimate source for ideas on planning, governance, and environmental management [2].

This tendency to marginalize IK stems from ignorance of its strengths and from the fact that Indigenous communities have developed, for centuries, resilient institutions, sustainable environmental practices, and spatial planning systems that adapt to changing social and ecological conditions. Marginalization of IK has meant, among other things, that lessons embedded in Indigenous knowledge systems are underutilized in contemporary planning theory and practice. Using Meta, Cameroon as a case study, this paper shows how Indigenous knowledge is a sophisticated, dynamic, and resilient planning system

Check for updates

Academic Editors: Jianming Cai, David Hou Chi Chow and Wuxing Zheng

Received: 11 June 2026
Revised: 22 October 2026
Accepted: 26 October 2026
Published: 1 November 2026

Copyright: © 2026 by the author. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license.

that includes settlement design, architecture, environmental stewardship, agriculture, and community governance.

Meta is a rural community in Cameroon's Northwest Region, 22 km from Bamenda, the regional capital (see Figure 1). It is culturally and ecologically diverse, with dispersed homesteads on hilltops and in valleys that seem adapted to their geographical and socio-political environment [3]. Over the last century, Meta has undergone spatial, economic, and institutional changes [4,5]. Exogenous factors, includingcolonial and postcolonial governmental reforms, infrastructure development, spatial organization policies, and endogenous factors like environmental dynamics, demographic transitions, violent conflicts, have shaped these changes. Yet, Meta's indigenous ethos has remained relatively intact, implying cultural resilience.

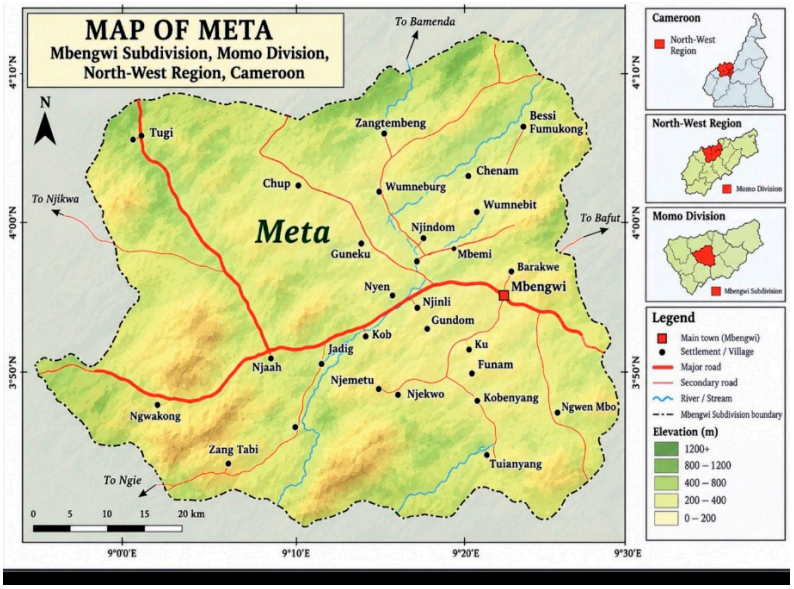


Figure 1. Map of Meta.

This begs many questions. Through Indigenous Knowledge Systems (IKS), Political Ecology Theory (PET), and Resilience Theory (RT), this study answers four questions.

1. How is Indigenous knowledge embedded in spatial organization, architecture, environmental management, and governance systems of Meta?
2. What social, cultural, political, and ecological mechanisms have sustained the resilience and adaptation of Meta's Indigenous knowledge system through colonialism, modernization, and globalization?
3. How do political and institutional processes shape the marginalization of Indigenous knowledge in planning and environmental scholarship and practice?
4. What lessons can contemporary planning and environmental policy learn from Meta's Indigenous knowledge system to enable more inclusive and sustainable development?

The paper is structured as follows. Following this introductory section, Section 2 describes the theoretical framework; Section 3 discusses the data and methodology; Section 4 presents the main findings; Section 5 discusses these findings; Section 6 presents a set of policy recommendations, and Section 7 concludes the paper.

2. Theoretical Framework

This research takes a relational approach to sustainability, conceptualizing it as an adaptive journey influenced by indigenous knowledge systems (IKS), environmental challenges, and institutional frameworks. It draws on insights from IK systems, political ecology, and re-

silience theory to examine how spatial organization adapts to changing circumstances [6–8]. Conventional models for sustainable human settlements focus on efficiency, density, and optimal infrastructure. However, these paradigms often overlook the socio-cultural and ecological intricacies of rural settings. In Meta, people have historically woven sustainability into practices such as dispersed settlement patterns, agroforestry techniques, and community-led resource management. The earliest and best-known hilltop settlement in the geopolitical entity known as Meta today is Zangmbeng. The Meta family lineage, known as the Mendick, first settled here under Teghnicha's leadership after arriving in Meta from Tadkon. From there, some relocated to Zangtebi, others to Ngwokweng and Tugi, and most to Medig [9]. This paper adopts a relational view of sustainability as an adaptive process shaped by local knowledge systems, environmental constraints, and institutional contexts.

As shown in Figure 2, the study employs three primary theoretical frameworks: indigenous knowledge systems (IKS), political ecology (PE), and resilience theory (RT).

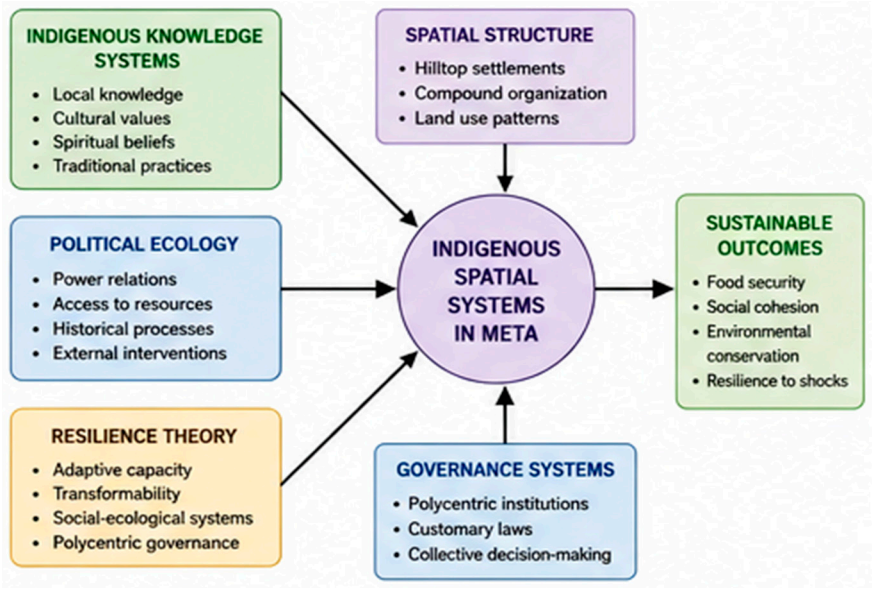


Figure 2. Theoretical Framework. (Source: Generated by GPT-6, OpenAI's latest-generation ChatGPT model. based on the author's detailed description).

Indigenous Knowledge Systems (IKS). These consist of localized customs and perspectives that shape how communities interact with their environments, often promoting long-term ecological balance and social cohesion. In rural African contexts, these systems include traditions related to land tenure, environmental stewardship, water management strategies, and governance structures that have been honed over generations [7,9–11].

Place-based knowledge is increasingly important for sustainable development because it matches resource use to local ecological capacities and fosters collective responsibility: many activities in Meta (farming, building houses, raising children) are done collectively. The African proverb "it takes a village to raise a child" expresses this responsibility. Institutions such as rotating credit associations (locally known as *Njangi*) link formal and informal financial markets in Cameroon and show how these links work. It predated colonialism and allowed groups to work together efficiently on large projects.

Political Ecology. Political ecology concerns how power relations, institutional arrangements, and governance structures determine access to natural resources and spatial configurations. It emphasizes that government policies, market forces, and historical inequalities can marginalize local communities by restricting their ability to use resources sustainably. For example, the Cameroonian government's prohibition on local or private exploitation of water bodies, such as lakes and rivers, effectively prevents rural areas such as

Meta from harnessing hydroelectric power. This creates a paradox: energy scarcity persists despite abundant resources. Centralized control over natural assets like water demonstrates how governance frameworks can both regulate access and limit opportunities for local advancement.

Resilience Theory. Resilience theory focuses on social-ecological systems' capacity to endure disruptions, adapt to change, and reorganize without losing critical functions. In rural settings such as Meta, resilience manifests in communities' ability to cope with shocks such as conflict or infrastructure failures through adaptive strategies supported by social networks [6,7,12,13]. This perspective underscores the importance of flexibility while highlighting learning processes and local agency as key components in creating sustainable settlements in unpredictable environments. Although natural disasters are infrequent in Meta's history, recent violent conflicts have impacted its communities significantly—most notably the ongoing war involving government forces against armed factions seeking independence for Cameroon's two Anglophone regions, alongside repeated assaults on villages by Mbororo cattle herders. These conflicts have considerably disrupted the stability of Meta's communities.

Analytical Transparency. To facilitate analytic transparency, the three conceptual frameworks—Indigenous Knowledge Systems (IKS), Political Ecology (PE), and Resilience Theory (RT)—are positioned as co-lenses that guide data and thematic analyses. Identifying and interpreting locally grounded spatial practices (indicators of settlement patterns, land-use strategies, and compound organization) aligns with Indigenous Knowledge Systems. In this regard, IKS helps analyze how knowledge embedded in cultural traditions and everyday practices informs decisions about location, resource use, and social organization. This lens suits the study of dispersed hilltop settlements, mixed cropping systems, and communal land management, which also reflect accumulated experiential knowledge.

Political Ecology provides a framework for analyzing how power relations, institutional frameworks, and historical processes shape spatial outcomes. It is activated through a critical examination of how colonial land policies, postcolonial governance regimes, and the assertion of state control over resources have shaped indigenous spatial arrangements. This framework also informs the examination of constraints on local agency, e.g., through restrictions on access to water resources or the marginalization of customary governance systems.

Resilience Theory evaluates the adaptive capacity of Meta's spatial systems to environmental, economic, and socio-political disturbances. This can be operationalized by identifying initiatives such as settlement dispersion, livelihood diversification, and hybrid energy use that are likely to promote flexibility, risk distribution, and recovery. This framework allows the assessment of communities' responses to shocks, such as climate variability and armed conflict, while maintaining core functional systems. These frameworks work in concert to structure the thematic coding process and to direct the interpretation of findings, moving the analysis from description through theory to a theoretically and empirically grounded explanation of how and why indigenous spatial systems endure and evolve. Taken together, these frameworks provide a multi-scalar analysis that considers the intersection of local knowledge, the environmental context, and broader political-economic forces that influence spatial organization in Meta.

By answering these questions, this paper emphasizes indigenous spatial and environmental knowledge as a vital yet underappreciated asset for planning sustainable human settlements and spatial structures writ large. The primary argument is that understanding these structures—commonly known as villages—in Meta requires more than simply applying standard planning frameworks; it demands a grounded understanding of the interactions among traditional physical and spatial practices, evolving governance systems, and external infrastructural influences. Analyzing these interactions offers insights into

redefining sustainability in rural African environments. From this perspective, this study contributes an empirically grounded analysis of how IKS is applied and functions in spatial planning and environmental stewardship in a rural African setting.

3. Methodology

This study uses a qualitative case study approach to examine indigenous spatial systems and environmental design in Meta, Cameroon. It treats these as exemplars of sustainable human settlement design. Its epistemological orientation is relational, conceptualizing space not just as a physical or geographical environment, but as a socio-ecological construct rooted in the interaction of culture, environment, history, and governance processes. It builds on the idea that indigenous spatial arrangements express context-specific knowledge and practices developed through long-term interaction between communities and their environment.

3.1. Research Design and Sources of Information

Meta is a pivotal case because of its rich tradition of indigenous spatial organization and its recent encounters with socio-political upheaval in Cameroon's Northwest and Southwest Regions. This investigation utilizes various qualitative data sources, including the author's extensive engagement with the area through field observations, informal discussions, and participation in local customs. Thus, the study draws on four complementary sources of information: the researcher's first-hand knowledge of Meta, informal conversations with elderly Meta informants, historians' and archival references, and a review of published literature. Conversations with elderly community members who know its historical development, customary institutions, spatial organization, and environmental practices are particularly meant to complement the researcher's contextual knowledge of Meta, archival and other historical materials, and published scholarly literature. The conversations are treated as sources of contextual and oral-historical information rather than as formal, structured interviews. The resultant information is supplemented with documentary evidence from history, including colonial records, historical accounts, and other documentary material. The research also integrates journal and book literature to situate Meta within generic discussions of Indigenous Knowledge Systems, spatial organization, human settlement, and environmental design and sustainable human settlements. Taken together, these four sources provide a broader evidentiary and interpretive basis for understanding the historical, cultural, institutional, and environmental dimensions of Meta's indigenous spatial systems.

Reliance on these sources aligns with an established tradition in African historical and ethnographic research that recognizes the value of oral accounts and community-held knowledge, particularly when investigating indigenous institutions and historical practices that written records may represent incompletely. For example, Quinn [14] combined archival materials with oral interviews conducted with Beti elders to reconstruct aspects of a traditional Cameroonian society. Similarly, Chilver and Kaberry [15] documented the precolonial history and ethnography of the Bamenda Grassfields, while Vansina [16] established a methodological foundation for critically interpreting oral sources in African historical research. Richards [17] further demonstrates the analytical importance of locally held knowledge in understanding indigenous environmental and resource-management practices. These sources are used complementarily and interpretively. The author's first-hand knowledge provides context and history, while archival information and published scholarship provide broader historical perspectives. Together, they help examine the historical and contemporary significance of indigenous spatial and environmental practices in Meta and their place in the world.

3.2. Analytical Framework

The analysis is based on three interrelated conceptual perspectives: Indigenous Knowledge Systems, Political Ecology, and Resilience Theory. Indigenous Knowledge Systems is a perspective on local spatial and environmental practices that draw on people's culture and are embedded in social and ecological contexts. Political Ecology examines power relations, governance, access to resources, and physical space. Resilience Theory offers an interpretive perspective to consider the ability of indigenous spatial and governance practices to accommodate, respond to, and adapt to disturbances such as environmental change and socio-political disruption.

These perspectives are complementary analytical lenses, not mutually exclusive. Collectively, they provide a basis for examining how historical experience, cultural knowledge, environmental conditions, and institutional structures have shaped Meta's indigenous settlement systems.

3.3. Analytical Strategy

The study's qualitative documentary analysis and interpretive synthesis draw on first-hand knowledge of the subject matter and the study area. Rather than using a formal interview-based or field-survey approach, the research draws on historical, archival, and scholarly material, along with the author's understanding of Meta. The study focuses on four related dimensions of indigenous spatial and environmental organization: settlement patterns, compound organization, land-use strategies, and traditional governance structures.

These dimensions are examined in relation to the three conceptual perspectives discussed above, focusing on how they interact and work together to make up the organization and functioning of human settlements. We also consider similar conclusions from studies of other African communities where relevant. This comparison helps place Meta in the context of indigenous spatial knowledge and environmental design without assuming that practices observed elsewhere are the same as those in Meta or vice versa.

3.4. Limitations

The study is context-specific and interpretative. Its reliance on the author's first-hand knowledge, informal conversations with elderly Meta informants, archival and other secondary materials, and published literature provides a basis for a thorough examination of Meta's indigenous spatial systems, but it is not a systematic, independently collected body of interview or observational data. Thus, we must read the results in relation to Meta's historical, cultural, ecological, and institutional context rather than treat them as statistically generalizable to other communities. They are more useful for their analytical and theoretical relevance and could be explored through comparative research in other settings.

Different sources of information offer opportunities for contextual corroboration and interpretive cross-checking. However, the analysis remains rooted in Meta's historical and socio-cultural context. Its main purpose is to provide insight into the spatial and environmental logic of an indigenous settlement system and its impact on the discussion of sustainable human settlement design.

4. Main Findings

Some of the most noteworthy revelations about indigenous Meta society are contained in archival sources, particularly documents prepared by colonial officials such as C.H. Croasdale [3] and C.J.A. Gregg [4], and anthropologists like Richard Dillon [18]. These and other sources provide important insights into Meta's indigenous ethos and practices related

to societal governance, the family, the family compound, spatial structures and architecture, dispersed hilltop settlements, and agriculture and land-use practices.

4.1. Societal Governance

Meta is polycentric or, from anthropological perspectives, acephalous [18]. In terms of societal structure, it comprises four lineage groups that established four main village districts named Mezang, Menyen, Mundam, and Bonjo [3]. Members of these lineages migrated from Tadkon to locales in present-day Meta, with the largest group, led by Teghenicha, settling in widely dispersed hilltop communities in Zangmbeng. From here, Teghenicha, believed to be the father of the Mendick, dispatched his male offspring to establish permanent communities in Tugi, Zang-Tabi, and Medig. It is reasonable to surmise that Zangmbeng, a plateau on rugged terrain, was chosen primarily for defense and security purposes during a period in Meta's evolution marked by internecine conflict and warfare. These communities collectively formed distinct yet decentralized governance systems, which anthropologists characterize as polycentric or acephalous [18]. Thus, Meta differs from many indigenous administrative setups in Cameroon's Grassfields region, where paramount chiefs typically preside.

Contemporary Meta, whose geographic boundaries align with those of Mbengwi Sub-Division, comprises thirty-one hereditary chiefdoms governing twenty-nine villages.The imbalance between the number of chiefdoms and villages is accounted for by the unique geopolitical setup of one of villages, Ngyen-Mboh. Ngyen-Mboh alone has three recognized traditional chiefs whose lineages trace to indigenous royal families [19]. Additionally, Meta includes four Mbororo hamlets, each overseen by an Ardo, regarded as a traditional chief. They coexist with but differ culturally from the Metas, who practice settled agriculture rooted primarily in valley-based communities, whereas the Mbororos retain nomadic tendencies focused predominantly on cattle husbandry.

Colonial and postcolonial governments in Cameroon have long tinkered with, manipulated, and reformed the Meta chieftaincy. Over the years, beginning with the Germans, Cameroon's pioneer colonial authorities, state interventions have altered both the spatial arrangements and the administrative bases of traditional authority in Meta [18,19]. From 1903 to 1905, German colonial authorities forcibly relocated the Meta villages of Bome and Zang to Bali Nyonga, a neighboring tribe that had embraced German colonial rule relatively early in the colonization process [18,20]. The relocation aimed to subdue the villages and compel them to accept German colonial rule. To meet this objective across Meta, the Germans placed the remaining villages, mainly based in Medig, under the suzerainty of the Fon of Nyen.

The colonial authorities vigorously pursued efforts to aggrandize Bali Nyonga's status, using Christian missions to dominate Meta and other Bamenda Grassfield groups. The role of the Swiss Basel Mission, which established its headquarters in Bali Nyonga in 1902, is especially noteworthy in this regard [21]. In line with this, the Basel Mission, in collaboration with the German colonial authorities, elevated the Bali Nyonga language, Mungaka, to be the regional lingua franca for the Bamenda Grassfields. Four years later, in 1906, the Mission published the first Bali primer and translated the Bible into Mungaka. From that point on, the language became the medium of communication in schools and Basel Mission churches in Meta and across different ethnic groups in the Grassfields region [21]. This effectively made Mungaka the dominant regional language for education and religious administration. Apart from promoting colonial governance efficiency, one aim of this colonial language policy was to elevate the cultural identity of a favorite tribal group, the Bali Nyonga, while diminishing that of Meta and other less favorable groups.

The armed German incursions into Meta in the early 1900s led some Meta groups to migrate to geographically distant locations. Spatially, unadulterated Meta-speaking

people live in areas that are not contiguous with Meta. These include villages such as Meforbei near Matazem in Santa Sub-Division, Banjah, uphill from Mendakwe in Bamenda Sub-Division, and Baforkum, near Bambili in Tubah Sub-Division, Mezam Division, which lends credence to this assertion. Also worth noting is the Meta village of Borsah, which is administratively part of the Bali Sub-Division in the Mezam Division. Thus, despite colonial efforts to disintegrate the Meta people as a geopolitical and/or linguistic entity, they remained intact. Today, groups speak unadulterated Meta both within and outside Meta, demonstrating remarkable resilience.

4.2. The Family

The traditional Meta family comprises a man, his wives, and children living in a compound of multiple buildings, as discussed in Box 1. Thus, the traditional Meta, like many traditional African societies, practices polygyny, that is, the marriage of one man to multiple wives. While extolling Meta for creating a sophisticated and highly functional societal governing structure—one that compared favorably with what he was familiar with in his native England—the British colonial Assistant District Officer for the Bamenda Province, C.J.A. Gregg, opined that Western civilization would find the Meta's polygamous practices unappealing (see [4]). Gregg's opinion is paradoxical given that his official Assessment Report on the Meta Clan revealed that its population of 13,462 at the time was 26% men, 37% women, 20% boys, and 17% girls ([4], p. 53). Extrapolating from these statistics, the institution of polygyny can be viewed as a rational strategy by the Meta society to curb or mitigate single motherhood. Another aspect of Meta traditional family worth noting is the "eternal attachment" of people to their place of nativity. The Meta believe and strive to ensure that "while one can take a Meta person out of Meta, one can never take Meta out of a Meta person." To guarantee this "eternal attachment" the Meta inter the umblical cord of their children in the paternal family compound. Except in the case of married women, the dead must be buried in that same compound so that they are reunited with their umbilical cords.

Box 1. The Spatial Logic of a Traditional Meta Compound. **Source:** Author's synthesis of first-hand knowledge and documentary materials in the study.

A traditional family compound in Meta can be seen as a spatial logic in which household life (family relations), food production, and community interaction are spatially linked. Residential structures are organized around a shared courtyard used for social interaction, family gatherings, and community deliberations. The proximity of residential spaces to agricultural plots, storage facilities, and household gardens shows how domestic organization relates to subsistence activities; where present, livestock areas and shared resource facilities link household livelihoods to the productive landscape. Beyond its physical layout, the compound is also a good entry point for understanding how customary authority, kinship relations, and collective practices shape space use and organization: access to land, household resources, and decision-making power may vary by gender, age, lineage, social status, and so on. The compound should not be unquestionably understood as an inherently equitable or environmentally sustainable arrangement. For rural planning purposes, it helps to understand local spatial practices before designing housing, infrastructure, water access, energy provision, and environmental management. Local knowledge should be valued, but inequalities need critical examination; distinguish historically documented practices from contemporary infrastructural additions.

4.3. The Family Compound

Compounds are another aspect of Meta's spatial logic. Box 1 contains a vivid characterization of a traditional Meta family compound. The compound constitutes the smallest unit of societal organization in Meta. It centers on the family; together, compounds form hamlets and then villages. Each compound typically contains a field *(Sami)* where ceremonial family or village dances take place. In this open space, they slaughter game that the chief

authorizes. They may hunt such game, including leopards, buffalo, and wild horses, only in groups and with the chief's authorization. The need for such authorization was instituted as a means of ensuring wildlife preservation.

Extended family compounds serve as economic units, socialization centers, and sites of governance. Their horseshoe shape supports internal solidarity and divides domestic and agricultural responsibilities. This spatial pattern enhances kinship relations and their relevance for common causes, such as agriculture and other resource management. As such, spatial organization is fundamentally connected to social structures (especially their principles and their spatial forms) in Indigenous Knowledge Systems.

4.4. Architecture and Building Construction

As summarized in Box 2, the building units comprising compounds in traditional Meta society are crafted from local materials such as raffia palms, mud, bamboo, and grass—demonstrating an advanced understanding not only of available resources but also of local climatic conditions; these structures embody technical knowledge passed down through generations, alongside communal labor traditions that reinforce social cohesion through collaborative construction efforts. In contrast, modern methods often depend on imported materials, ultimately leading to capital flight and the erosion of local expertise while raising ecological footprints across Africa. Vernacular architectures such as earthen compounds across Mali and stone-built residences in Zimbabwe show how traditional building techniques offer sustainable alternatives to resource-intensive contemporary designs [22].

Yet compounds are more than architectural forms—they serve as crucial nodes for sustenance and resilience, with surrounding family farms providing immediate access to food and reducing reliance on external markets, especially in insecure circumstances where violence or infrastructure disruptions may limit movement. Embedding food production in domestic spaces helps maintain some degree of food sovereignty even amid crises. Similar arrangements exist among Yoruba communities in southwestern Nigeria and among the Bamileke peoples in western Cameroon, where home gardens buffer against food shortages or economic instability [23,24].

Box 2. Traditional buildings in Meta: Local materials and building practices. **Source**: Author's synthesis from first-hand knowledge and the study's contextual materials.

Traditional buildings in Meta use locally available materials and construction techniques adapted to the local context; timber frame with walls made of wattle-and-daub (lattice of wooden or bamboo strips supporting an earthen mixture). A grass roof (architectural feature) extends beyond the walls to shelter from sun and rain. Timber posts support the structure, while a raised or stone-reinforced base forms the foundation for walls. These features show how traditional building practices rely on local materials, accumulated construction knowledge and skills learnt within the community. Use of earth, timber and plant-based roofing materials also raises important questions about availability (and maintenance), durability and thermal performance under local climatic conditions. The environmental advantages of traditional construction are not inferred from the building materials alone; rather, this inference is informed by comparison with alternative methods. For contemporary rural planning, the Meta example shows that indigenous architectural knowledge should be documented and evaluated when policies for housing are developed as well as building designs. This knowledge could inform context-sensitive approaches to rural housing if traditional techniques are assessed against current requirements for structural safety, durability, affordability and changing household needs.

Traditional Meta construction uses the long-standing wattle-and-daub technology, reflecting the inseparable link between environmental adaptation and socio-spatial organization. The technology involves threading bamboo or wooden strips into a structural lattice (the wattle), then cladding it with a composite of clay, soil, sand, and organic fibers

(the daub). The result is resilient, ecologically appropriate, and adaptable walls that are thermally efficient and provide internal comfort regardless of prevailing weather conditions.

The technology is grounded in careful calibration to local ecological conditions, maximizing the use of abundant earthen materials and minimizing reliance on wood resources. But this architecture's importance goes far beyond its materials and surroundings. Meta buildings are seldom envisioned as standalone units; instead, they are placed within compound-type spatial arrangements built on a semi-enclosed or horseshoe layout that surrounds a courtyard. Such compounds exist in productive landscapes with gardens, tree crops, and livestock enclosures, linking habitation to subsistence and economic activity. Such arrangements reflect a holistic understanding of space in which domestic, productive, and ecological functions are inextricably connected.

The collective nature of construction is equally important. Building is an all-hands-on-deck project that mobilizes kinship networks and strengthens social cohesion. Structural components are prefabricated—walls are built with bamboo substructures, and bamboo roof units are shaped into triangles that, once in place, form pyramidal roofs. This demonstrates advanced knowledge of geometry and modular construction, along with a near-awakening talent for aligning technical proficiency. These processes not only create physical structures but also reproduce social relations and embed architecture within systems of reciprocity and mutual obligation.

4.5. Dispersed Hilltop Settlements

One of the most salient legacies is that, for generations, Meta settled on hilltops. Richard Dillon characterized these hilltops as grassy and marked, delineated by valleys to the north and south, two of which opened onto the plateau in the northeast ([24], p. 54). Choosing such a location was an adaptive response to environmental and security concerns. Elevated sites not only offered opportunities for observation during inter-tribal conflict but also provided microclimatic advantages, such as lower humidity and reduced exposure to vector-borne diseases. This settlement logic resonates in the contemporary context of renewed insecurity prompted by the Anglophone crisis. Some families have reverted to hilltop settlements as a defensive strategy, suggesting that this ancient, deeply rooted indigenous spatial knowledge continues to function as an adaptive, living system rather than having fallen into disuse with age.

Similar patterns can be observed throughout Africa; for instance, Tigray communities in northern Ethiopia historically utilized dispersed highland settlements for ecological benefits while seeking refuge during conflicts [25]. Parallels are also noted among populations in parts of the Great Lakes region where elevated settlements serve protective functions during periods of insecurity—reinforcing the broader relevance of elevation-based habitation strategies informed by indigenous ecological wisdom [8].

4.6. The Natural Environment and Land Tenure

The indigenous Meta ethos reveres the natural environment. Rivers, streams, and lakes, the traditional Meta believes, are the resting place of their ancestors. Therefore, trees, rivers, and lakes must never be adulterated or destroyed. The trees are believed to provide shade and shelter for these ancestors. Access to and control over land in Meta are based on kinship relations, lineages, and collective management. According to Meta's indigenous culture, land is inherently a common, shared resource that connects the living to their ancestors and unborn generations. This ethos holds that land cannot be owned, sold, or exchanged because it is a gift from God; the living serve as custodians of land that belongs to the dead and unborn generations. Within this ethos, the Fon and the traditional council symbolically hold ultimate guardianship of the land; they serve as the community's custodians. This

aspect of the indigenous Meta ethos has faced fierce attacks from external forces since the onset of European colonialism in Africa.

The Germans, Cameroon's pioneering colonial master, took the first step in this direction by enacting the German Crown Act on 15 July 1896 [26]. Thus, by 1905, when German colonial authorities conquered and formally brought Meta under German control, the Act was already in force. It converted all 'vacant and unoccupied' lands throughout Kamerun (today, Cameroon) into German Crown property. This meant that all land within the territory, including Meta, was German Crown property, given the sparse population distribution at the time. The Germans went further in efforts to supplant the indigenous knowledge systems of the Meta and the rest of Cameroon by creating the national land register, *Grundbuch*. Land transactions, once informal, were then required to be recorded in this register. This formalization process was accompanied by land commodification. Thus, land was effectively transformed into an economic good that could be sold and/or exchanged—a development that contravenes traditional Meta values. Post-colonial authorities in Cameroon inherited and reinforced this system. One way they did this was by enacting Land Ordinance No. 77-1 of 10 January 1977, which recognizes the land certificate as the sole proof of land ownership in the country [27]. This means instruments such as land deeds, certificates of occupancy, or other informal proofs of ownership became null and void once the Land Law took effect.

4.7. Agriculture and Land-Use Practices

Farming is a family affair in Meta. The Meta family, which is described as polygynous and patrilocal, is the basic economic unit [18]. It depends mainly on subsistence farming and trade. A male elder, who controls several parcels of family land and many economic trees, oversees the family. A typical traditional Meta farm includes a mix of crops, including shorter ones like vegetables, Colocasia, and potatoes, and taller ones such as plantains, oil palm, and fruit trees. As a result, traditional Meta people practice mixed cropping. To rejuvenate the soil, they use dried grass as manure. They also allow exhausted farmland to fallow for up to four years [18]. Farming has always been a collective endeavor among the Meta people. In this respect, people organize themselves into Rotating Task Execution Groups (ROTEG) and agree to work on each member's farm in turn [6]. Another prominent traditional Meta farming activity is animal rearing, with the main domesticated species being goats, sheep, pigs, and chickens. Large animals, particularly cows, are also common in Meta. Mbororos rear these animals, which co-exist with the Metas but live mainly on the hilltops.

A noticeable feature of Meta indigenous agriculture is mixed cropping, unlike monocropping (see Box 3). Other features include agroforestry and rotational fallowing. The fallow period for village plots, as Dillon noted, was usually between one and four years [18]. These practices increase soil fertility, reduce environmental degradation, and create a wider variety of foods [13,28,29]. Since ancient times, the Meta have cultivated colocasia, maize, yams, pumpkins, plantains, and oil palms. They typically grew these crops in cool, moist valley bottoms—reflecting their sophisticated agricultural knowledge. In terms of resilience, crop diversification reduces risk by spreading exposure across multiple crops and ecological niches. These practices also show how indigenous environmental knowledge fits within emerging global sustainability trends, supporting ecological balance in low-external-input contexts.

The ecologically embedded farming and land management practices of the Meta contrast with Eurocentric alternatives that tend to deplete soils and increase susceptibility to pests and climate variability. From this perspective, Meta's IK-rooted farming practices increase biodiversity and support more efficient nutrient cycling, particularly for maize,

beans, cocoyams, and plantains, which are cultivated synergistically to maximize land use. This approach broadly aligns with agroecological approaches widely recognized across sub-Saharan Africa, showcasing intercropping methods used by smallholder farmers in Kenya and Ghana to sustainably improve yields without compromising ecosystem integrity [16,28,30]. These practices are reinforced by cultural norms that emphasize stewardship, longevity, and sustainability over transient extraction, values entrenched more deeply than single-season yields and crucial to ensuring viability for future generations [13].

Box 3. Mixed Cropping in Meta and Monocultural Agriculture. **Source**: Author's synthesis of Meta case and agricultural and historical literature.

Indigenous mixed cropping in Meta. Traditional agricultural practices in Meta include mixed cropping (growing two or more crops together on the same plot). This practice is based on locally accumulated knowledge about crops, soils, seasons, and household production needs. Diversification of crops grown allows households to get different food products from the same land and may reduce dependence on a single crop's success; it can also distribute production risks (depending on the crops and management practices involved) and support complementary use of resources (depending on the crop combinations, soil conditions, labor availability, etc.). Effectiveness depends on crop combinations, soil conditions, labor availability, and so on.
Monocultural agriculture is related to commercial and colonial production systems. Monocultural agriculture is the cultivation of one crop in a given area (often for specialized production, mechanization, standardized management or commercial marketing). In some colonial contexts, European agricultural policies favored specialized cash-crop production for external markets, displacing or subordinating food-crop systems. Under certain conditions, monoculture can offer production and marketing advantages, but intensive systems may increase dependence on a single commodity; when crop diversity and soil management are poor, pest pressure, soil degradation, and market fluctuations increase exposure.
Implications for rural planning. The contrast is not between an inherently sustainable indigenous system and an inherently unsustainable European one, but between agricultural practices that reflect different historical priorities, knowledge systems, market relationships, and ecological conditions (Meta). For Meta, the planning challenge is to see the value of locally adapted mixed cropping as well as critically assess whether diversified and specialized production systems perform well against food security needs, livelihood requirements, environmental conditions and farmers' own priorities.

Within Meta's ethos, rivers, streams, and forests are regarded not merely as economic resources but as sacred entities imbued with moral and cosmological significance. Prohibitions against overexploitation serve as informal regulations that protect these ecosystems, foster conservation-oriented relationships, balance human utility, and respect nature's limits. This reflects water ethics in various African societies, such as the Akan reverence for sacred groves and water bodies in Ghana and the Oromo reverence for water bodies in Ethiopia [25,28–31]. It also reveals spiritual values and enhances sustainable governance models that are often more effective than externally imposed regulatory schemes.

5. Discussion of Findings

This research indicates that indigenous beliefs about land and natural resources, settlement patterns, and the spatial arrangements of indigenous communities in Meta form a cohesive, adaptive system. This revelation affirms that Meta's indigenous practices across domains constitute ecologically sound systems shaped by environmental, socio-political, and institutional variables. Rather than static cultural outputs, these systems are highly adaptive and responsive, as Indigenous Knowledge Systems, Political Ecology, and Resilience Theory emphasize.

Agricultural practices in Meta further illustrate the interplay between environment and indigenous knowledge. The region's fragile soils and variable rainfall patterns necessitated adaptive land-use strategies, including mixed cropping, agroforestry, and rotational fallowing. These practices are not only ecologically sound but also socially embedded, relying on

cooperative labor systems such as Rotating Task Execution Groups. The continued use of these systems reflects both necessity and resilience, especially amid declining soil fertility and increasing land pressure from population growth. At the same time, colonial-era promotion of cash crops—especially coffee—introduced monocropping tendencies that disrupted traditional systems, contributing to environmental degradation in some areas.

Cultural beliefs and environmental ethics also shaped resource use in Meta's historical context. Sacred groves, protected watersheds, and ritual restrictions on land use reflect longstanding cosmologies that frame nature as a collective and spiritual asset. These norms historically functioned as effective conservation mechanisms. However, demographic pressures, religious change, and state policies that reclassify land as public property have weakened their authority, undermining customary tenure systems. While the Meta society has undergone significant cultural transformation, its indigenous ethos holds that land and the natural environment, including all bodies of water, are gifts from God. Thus, they cannot be sold, traded, or abused. Those alive are considered custodians of these resources, which traditional Meta people believe belong to their ancestors and unborn generations. They also believe rivers, streams, and lakes are the resting place of their ancestors; therefore, they must never cut down or destroy the trees around them. They believe the trees provide shade and shelter for the ancestors [29,32,33].

This worldview functions not only as a spiritual belief system but also as an effective mechanism of environmental governance. By embedding resource management within moral and cosmological frameworks, the Meta establishes informal yet powerful regulatory systems that discourage overexploitation and promote long-term ecological balance. Restrictions on tree-cutting around water sources, for example, support watershed protection, soil stability, and sustained water flow, even without formal environmental policies [29]. Moreover, intergenerational stewardship reinforces a conservation ethic that aligns closely with contemporary sustainability principles, emphasizing responsibility to both past and future generations [2].

Comparable systems of spiritually grounded environmental stewardship appear across other parts of Africa. Among the Akan of Ghana, sacred groves and water bodies are protected through taboos and ritual prohibitions that restrict access and resource extraction, thereby preserving biodiversity and ecological integrity [16]. Similarly, the Oromo of Ethiopia uphold the *Gadaa* system, which integrates environmental governance with social and spiritual institutions, including protecting water sources and grazing lands [32–34]. In Nigeria, Yoruba communities maintain reverence for rivers such as the Osun, where cultural beliefs underpin conservation practices that limit pollution and deforestation around sacred sites [24]. These parallels highlight a broader pattern across the continent in which indigenous cosmologies serve as practical frameworks for environmental management. The findings further confirm that Meta's indigenous spatial systems are not mere cultural artifacts; they are dynamic, knowledge-based adaptations to complex and changing conditions. Interpreted through the lenses of Indigenous Knowledge Systems (IKS), Political Ecology (PE), and Resilience Theory (RT), several important insights emerge.

5.1. IKS Interpretations

From an Indigenous Knowledge Systems (IKS) perspective, the persistence of the Meta villages, language, traditions, and culture writ large is especially noteworthy. Aspects of the people's cultural practices, such as hilltop settlements, compound organization, and mixed farming systems, remain vibrant and strong. They embody IKS and reflect deeply embedded, place-based knowledge accumulated over generations. These practices are not incidental; they reflect a sophisticated understanding of ecological processes, climatic variability, and social organization. Their continued relevance—as evidenced, for example,

by the reoccupation of hilltops during periods of insecurity, such as the ongoing so-called Anglophone Crisis—demonstrates that indigenous knowledge remains a living, functional system rather than a residual tradition [11,31,35–37]. The historically established strategy of dispersed hilltop settlements is an adaptive response to a range of challenges. These elevated sites historically offered safety during intergroup conflicts and provided microclimatic benefits, such as low humidity and a reduced risk of vector-borne diseases. Current evidence indicates that some households are returning to these hilltop areas amid contemporary insecurity. Re-embracing hilltops as a settlement option, especially for defense and security, is not a uniquely Meta phenomenon. The recent (2022) creation of an International Scientific Network, christened Late Antique Hilltop Settlements (LAHIS), in Europe suggests that, as a scholarly issue, hilltop settlements are regaining their once-lost allure. From its inception, the network included 40 archaeologists from 18 European countries [38].

The organization of space around compounds is crucial to social, economic, and governance frameworks. The traditional compound layout—often horseshoe-shaped—combines living, productive, and ceremonial spaces. This arrangement strengthens family ties, promotes collaborative labor, and integrates governance into daily spatial practices. Indigenous agricultural practices are closely linked to ecological sustainability. Methods such as mixed cropping, agroforestry, and rotational fallowing not only enhance soil health but also foster biodiversity and reduce vulnerability to climate fluctuations. These agricultural systems rely on collective labor, such as Rotating Task Execution Groups (ROTEGs) [6,35].

Persistent efforts by external forces to supplant the Meta's traditional practices in many domains can also be seen as attempts to sideline IKS. The land reform initiatives the Germans set in motion are illustrative. These initiatives constitute a foundational disruption of Meta's indigenous land tenure system, replacing a deeply embedded custodial ethic with a commodified, state-centered regime. Under the indigenous system, land was not a tradable asset but a sacred trust binding together all living people, the ancestors, and future generations, governed through kinship structures and overseen by the Fon and traditional council.

Through the 1896 German Crown Act [26] and the institutionalization of land registration through the *Grundbuch*, state authority alone effectively established land as alienable property, nullifying customary claims. This transformation not only symbolically and materially dispossessed communities but also undermined the moral and spiritual foundations that had long regulated sustainable land use. Instead of renewing indigenous tenure systems, the postcolonial Cameroonian state consolidated this shift through the 1977 Land Ordinance [27], which privileged formal land certificates and delegitimized customary rights, resulting in deeper local disenfranchisement. From an Indigenous Knowledge Systems (IKS) perspective, the transition is not merely about passing new laws or policies; it uproots a holistic, resilient, and sustainable environmental governance system. Meta's indigenous or customary tenure arrangements guaranteed ecological stewardship alongside social norms, spiritual beliefs, and intergenerational responsibility, allowing more balanced, community-oriented land use. In contrast, the externally imposed system emphasizes individual ownership and market exchange and frequently prioritizes short-term exploitation over long-term sustainability. Such tensions—reflected in land insecurity, environmental degradation, and reduced communal authority—attest to how Eurocentric land policies fail when they are not part of broader contexts such as Meta. Re-centering IKS in land governance is therefore not just a matter of cultural logic but also a practical imperative for restoring sustainable resource management and strengthening communities' capacity to recover.

Indigenous Knowledge Systems (IKS) take on deeper meaning when situated within Meta's specific historical, geographical, and institutional context as a geopolitical entity in

Cameroon's Northwest Region. Rather than representing abstract patterns, the observed spatial and social arrangements reflect place-specific IKS shaped by the area's topography, history of conflict, and evolving governance structures. Meta's hilly terrain and undulating landscape, located near the Northwest Regional capital, Bamenda, provide an essential backdrop for understanding the persistence of dispersed hilltop settlements. These elevations are not incidental; they reflect deliberate responses to ecological and security considerations. Historically, the region experienced periodic inter-tribal conflicts and raids. The Meta were raided and, in turn, raided neighboring tribal groups such as the Oshie's, the Ngie's, and the Mundum's to gain control and settle at sites that became their present villages, making defensible, elevated locations strategically advantageous. At the same time, hilltops' cooler microclimates and better drainage reduced exposure to malaria and waterborne diseases—an important consideration in a region with marked wet and dry seasons. The recent resurgence of insecurity linked to the Anglophone crisis further reinforces this logic, as some inhabitants have reverted to earlier settlement strategies, underscoring the continued relevance of indigenous spatial knowledge.

The compound-based organization observed in Meta reflects IKS rooted in its sociocultural and political history. Traditionally, lineage systems under the authority of the Fon and subordinate institutions governed spatial arrangements, reflecting and reproducing kinship hierarchies and collective governance structures. Compounds function not merely as residential units but as nodes of economic production, socialization, and dispute resolution. This is evident in the continued importance of communal labor arrangements and lineage-based land allocation practices. Even as colonial and postcolonial administrations introduced new governance layers—such as local councils and state-appointed authorities—these indigenous spatial and institutional forms have persisted, often operating in parallel with formal systems.

5.2. Political Ecology Perspective (PEP) Interpretations

Through the lens of Political Ecology, the findings highlight the central role of power and external intervention in shaping spatial outcomes [36]. Colonially-induced forced relocations, such as the forced relocation of residents of Meta villages in Zang Tabi and Bome to Bali Nyonga in 1905 [18], and postcolonial administrative restructuring, such as the Presidential Decree No. 77/245 of 1977 that made Fons auxiliaries of the national government, and the national state control over natural resources, have disrupted indigenous governance systems and constrained local resource access [27]. Yet, these interventions have not resulted in wholesale replacement. Instead, they have produced hybrid systems in which traditional and formal institutions coexist, often uneasily. This underscores the importance of viewing spatial change as politically mediated rather than purely technical or developmental. External influences—especially those stemming from colonial and postcolonial policies—have notably altered spatial configurations and institutional structures. Such interventions have included forced relocations, modifications to traditional authority structures, and increased state control over natural resources, often limiting local self-governance.

State control over natural resources has significantly constrained local adaptations to land use. In Cameroon, laws, especially those administered by the Ministry of Mines, strictly regulate river and mineral exploitation. These laws effectively restrict private or communal access to rivers, thereby hindering rural populations, such as those in Meta, from using small-scale hydroelectric power despite abundant water resources. This creates an irony: resource-rich environments that lack adequate energy supplies—a pattern common throughout Sub-Saharan Africa. These limitations restrict opportunities for self-sustaining

development while increasing reliance on centralized infrastructure that frequently neglects rural needs.

Political forces—particularly the interventions of colonial and postcolonial states—are especially evident in the restructuring of spatial organization and governance. Colonial authorities introduced centralized administrative systems, redefined land ownership, and, in some cases, encouraged nucleated settlements for easier control and taxation. Postcolonial policies have continued to reshape the landscape through infrastructure development, education, and integration into national and global markets. In Meta, these changes are visible in the gradual emergence of roadside settlements and the partial decline of traditional hilltop homesteads. Yet, these transformations have not erased indigenous systems; instead, they have produced a hybrid spatial order in which traditional and modern forms coexist and interact.

More importantly, the ongoing Anglophone conflict has added a new dimension to these dynamics. Disruptions to mobility, agricultural production, and local governance have tested the resilience of indigenous systems. In many cases, however, these systems have provided critical coping mechanisms. Kinship networks, community-based labor systems, and localized food production strategies have helped sustain livelihoods amid instability. This reinforces the argument that resilience in Meta is not merely a theoretical construct but a lived reality grounded in social and spatial practices.

Taken together, these context-specific dynamics illuminate this study's central concern with continuity and change. The persistence of indigenous spatial patterns in Meta is not stagnation but adaptive transformation. Local communities have selectively integrated external influences while maintaining core elements of their socio-spatial organization. This process reflects both agency and constraint, shaped by environmental realities, historical legacies, and contemporary political conditions.

For rural planning and sustainability, the implications are clear. Meta demonstrates that effective development strategies must engage with locally embedded knowledge systems and spatial logics. Top-down interventions that ignore these realities risk undermining existing adaptive capacities [35,36]. Conversely, policies that recognize and build upon indigenous practices—while addressing their limitations—are more likely to produce sustainable and contextually appropriate outcomes.

5.3. Resilience Theoretical Perspective (RTP) Interpretations

From a Resilience Theoretical perspective, Meta's spatial organization demonstrates significant adaptive capacity. The integration of residential, agricultural, and social functions within compounds enhances self-sufficiency and reduces vulnerability to external shocks. Similarly, diversified farming systems and strong social institutions (e.g., ROTEGs, kinship networks, and hometown associations (HTAs)) buffer environmental stress, market disruptions, and conflict (see e.g., [38]). However, resilience here should not be romanticized. Population growth, environmental degradation, and protracted political instability increasingly strain these systems. Cultural-environmental ethics strongly influence land-use regulations. People commonly view natural resources such as land, forests, and water bodies as sacred communal assets governed by norms that prevent overexploitation and promote long-term stewardship. Despite facing these challenges, the community in Meta demonstrates substantial adaptive capacity. Indigenous institutions, social networks, and knowledge systems continue to evolve, enabling communities to address environmental shifts, political upheaval, and economic change while preserving key aspects of their spatial arrangements and cultural identity. Over the years, Meta people, like other Cameroonians or Africans in general, have maintained ties with their home-based village communities through HTAs [39].

Despite all kinds of shocks—colonial rebuilding, market inclusion, and ongoing armed conflict—communities in Meta demonstrate high adaptive capacity. This is evident in the social work systems, land use, hybrid forms of power, and collectivist social and labor practices. But those systems face mounting pressure from population explosion, environmental collapse, and political turmoil. These results show that we should view indigenous spatial systems not as ideal models but as dynamic paradigms that can create both opportunities and limitations. Taken together, this evidence shows that Meta's spatial systems embody a form of situated sustainability, grounded more in local knowing, ecological knowledge, and social organization. These non-transferable systems can help rethink rural development processes in Sub-Saharan Africa, particularly where formal planning institutions have been weak, non-local, or poorly grounded.

More importantly, the findings address the study's central questions regarding continuity and change. The endurance of key spatial and institutional features suggests that indigenous systems persist not despite change, but through adaptive transformation. Exogenous forces have altered the context within which these systems operate, but endogenous knowledge and practices have enabled communities to reinterpret and reconfigure them. Finally, the study contributes to broader debates on rural planning and sustainability. Rather than offering Meta as a universally replicable model, the findings underscore the value of context-sensitive, locally grounded approaches. They suggest that sustainable rural development strategies in Sub-Saharan Africa should engage with, rather than override, indigenous spatial logics and governance systems. In doing so, they challenge dominant planning paradigms that privilege standardized, top-down interventions over adaptive, community-based bottom-up solutions.

6. Policy Recommendations

The findings of the study reported in this paper suggest several implications for rural planning in contexts such as Meta. First, planning agencies should undertake participatory spatial mapping before major development interventions to document existing settlement patterns, customary land uses, agricultural areas, water resources, culturally significant sites, and community institutions [34–36]. Second, planning processes should institutionalize meaningful participation by customary authorities and diverse community groups, including women, youth, and farmers, in decisions affecting land, infrastructure, and environmental management. Such engagement must also address inequalities embedded in customary institutions, particularly those concerning women's access to land and participation in decision-making.

Third, planning interventions should combine locally embedded knowledge with scientific and technical expertise. Indigenous practices in agriculture, settlement organization, and resource management can inform context-sensitive infrastructure and environmental planning, while technical assessments can help evaluate environmental risks and infrastructure needs. Fourth, support customary and community-based governance arrangements through transparent decision-making, accountability, and inclusive representation, rather than assuming they are inherently equitable or effective. Finally, planning agencies should recognize Indigenous Knowledge Systems as dynamic and evolving, adapting interventions to changing environmental, socioeconomic, and political conditions rather than seeking to preserve an idealized traditional settlement model.

Together, these recommendations favor a context-sensitive and institutionally plural approach to rural development. The principal policy lesson from Meta is not that customary systems should replace formal planning, but that effective rural planning should engage local knowledge and institutions while addressing inequalities, strengthening accountability,

and evaluating proposed interventions against locally defined needs and environmental conditions.

7. Conclusions

This study shows that Meta's indigenous spatial systems are dynamic, contextualized frameworks for sustainable rural development, not static cultural relics of the past. The evidence suggests that sustainability in Meta rests not only on physical spatial structures, but also on how ecological knowledge interacts with socio-cultural values and customary governance institutions that regulate land and environmental stewardship. The analysis shows that Meta has a robust spatial organization, typified by scattered hilltop habitats, compound living, and coordinated land use and development processes. These elements are well adapted to local ecological environments and help reduce environmental hazards while increasing the likelihood of food security and community cohesion. Agricultural practices such as mixed cropping, fallowing, and agroforestry show how indigenous knowledge systems maintain soil fertility and biodiversity while minimizing reliance on external inputs.

In this respect, Meta provides evidence for broader sustainability science arguments that privilege low-input, ecologically embedded production systems. Customary land tenure and governance structures also help enforce sustainability practices [35,39–42]. Kinship networks and the local community govern land tenure and use in Meta. Within this framework, land is not viewed as a commodity but a gift from God that cannot be sold, exchanged, or owned outright. This framework affords long-term custodianship of land and natural resources, discourages speculation and exploitation, and fosters generational equity. Meta-Indigenous ethos also mandates embedded cultural normative commitments to sacred forests, rivers, or local vegetation. This serves as an informal form of regulation that fosters ecological conservation. These findings indicate how indigenous institutions manage common-pool resources, and how native institutions could support the governance of common-pool resources under sustainable models [42]. Yet at the same time, the research acknowledges how these indigenous structures are substantially transformed by exogenous factors: colonial land policies, post-colonial state interventionism, and adoption of Eurocentric models of land tenure and agriculture [43–47].

In some cases, formal legal systems have institutionalized land ownership, undermining customary governance, weakening community governance, and transforming customary relations with the wild and natural world [48,49]. Similarly, the rise in monocrop, market-oriented agriculture has led to practices that can conflict with locally adapted, ecologically sustainable practices. These changes highlight the friction between indigenous knowledge systems and externally imposed development paradigms. The potential consequences of these results are both theoretical and pragmatic. Theoretically, the study contributes to ongoing debates in sustainability science, political ecology, and resilience theory by providing evidence that indigenous spatial systems can model adaptation, resource efficiency, and ecological balance. It further supports the proposition that sustainability cannot be defined or realized without appreciating deeply embedded knowledge systems adapted to local social contexts. In practice, this could inform rural development policies by shifting to more context-appropriate strategies that acknowledge and integrate indigenous knowledge systems, rather than implementing general, monolithic, top-down, Western-oriented development approaches.

The study, however, has limitations. As a qualitative case study, its findings are context-specific and not intended to be universally generalizable. Yet, the study provides a basis for drawing parallels in other places in Africa and beyond. However, more cases need to be examined to determine implications beyond the region. Further work could include, at a minimum, quantitative data that deepen qualitative knowledge and analyses of sustainabil-

ity measures' performance. In summary, the Meta case provides evidence that indigenous spatial systems contribute significantly to sustainable rural development where ecological fragility and low external contributions are prevalent. However, rather than seeing such systems as dated or incapable of supporting modernity and modern development, there is strong reason to acknowledge that they remain necessary and can play a role in sustainable development initiatives.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The original contributions presented in this study are included in the article. Further inquiries can be directed to the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Khayesi, M. (Ed.) *Rural Development Planning in Africa*; Palgrave Macmillan: New York, NY, USA, 2018. [CrossRef]
2. Robbins, J.A.; Dewar, J. Traditional Indigenous Approaches to Healing and the modern welfare of Traditional Knowledge, Spirituality and Lands: A critical reflection on practices and policies taken from the Canadian Indigenous Example. *Int. Indig. Policy J.* **2011**, *2*, 1–17. [CrossRef]
3. Croasdale, C.H. *Intelligence Report on the Menemo-Speaking Families of the Widikum Tribe in Bamenda Division of the Cameroons Province*; Unpublished Report, WCNAB, ADM702/Ab19; British Colonial Gov't: London, UK, May 1933.
4. Gregg, C.J.A. *An Assessment Report on the Meta Clan on the Bamenda Division of Cameroon Province*; British Colonial Office: London, UK, 1924.
5. Njoh, A.J. The Meta Indigenous Politico-Administrative System, Good Governance, and the Modern Republican State in Cameroon. *J. Asian Afr. Stud.* **2015**, *50*, 305–324. [CrossRef]
6. Njoh, A.J. *Tradition, Culture and Development in Africa: Historical Lessons for Modern Development Planning*; Ashgate: Aldershot, UK, 2006.
7. Folke, C. Resilience: The Emergence of a Perspective for Social-Ecological Systems Analyses. *Glob. Environ. Chang.* **2006**, *16*, 253–267. [CrossRef]
8. Adger, W.N. Social and ecological resilience: Are they related? *Prog. Hum. Geogr.* **2000**, *24*, 347–364. [CrossRef]
9. Berkes, F. Religious Traditions and Biodiversity. In *Encyclopedia of Biodiversity*, 2nd ed.; Levin, S.A., Ed.; Academic Press: San Diego, CA, USA, 2013; pp. 380–388.
10. Bryant, R.L.; Bailey, S. *Third World Political Ecology*; Routledge: London, UK, 1997.
11. Bryant, R.L. Political ecology: An emerging research agenda in third world studies. *Political Geogr.* **1992**, *11*, 12–36.
12. Walker, B.; Salt, D. *Resilience Thinking: Sustaining Ecosystem in a Changing World*; Island Press: Washington, DC, USA, 2006.
13. FAO. *Indigenous Peoples' Food Systems: Insights on Sustainability and Resilience from the Front Line of Climate Change*; FAO; Alliance of Bioversity International; CIAT: Rome, Italy, 2021.
14. Quinn, F. Beti Society in the Nineteenth Century. *Africa* **1980**, *50*, 293–304. [CrossRef]
15. Chilver, E.M.; Kaberry, P.M. *Traditional Bamenda: The Pre-Colonial History and Ethnography of the Bamenda Grassfields*; Ministry of Primary Education and Social Welfare: Buea, Cameroon, 1967.
16. Vansina, J. *Oral Tradition as History*; University of Wisconsin Press: Madison, WI, USA, 1985.
17. Richards, P. *Fighting for the Rainforest: War, Youth and Resources in Sierra Leone*; James Currey: Oxford, UK, 1996.
18. Dillon, R. *Ranking and Resistance: A Prcolonial Cameroonian Polity in Regional Perspective*; Stanford University Press: Los Angeles, CA, USA, 1990.
19. Nji, A.; Mbakwa, M.A.; Agwe, J.A. *A History of Tugi: An Emprical Case Study in the Sociology of Politics and Development*; Maryland Printers: Bamenda, Cameroon, 2009.
20. Nkwi, P.N. *The German Presence in the Western Grassfields 1891–1913: A German Colonial Account*; Research Report #37; African Studies Centre: Leiden, The Netherlands, 1989.
21. Titalanga, G.B.; Gwanfogbe, M.B.; Nfi, J.L. The Symbiosis of Bali Nyonga-basel mission relationship: Understanding the influence of Bali Nyonga through the prism of basel mission vernacularization in the western grassfields of Cameroon, 1902–1963. *Int. J. Integr. Educ.* **2021**, *4*, 349–362.

22. Pikirayi, I. Stone architecture and development of power in the Zimbabwe tradition AD 1270–1830. *Azania Archaelogical Res. Afr.* **2013**, *48*, 282–300. [CrossRef]
23. Nathaniel, O.; Bada, A.B. Identification of Yoruba Indigenous Knowledge Systems Relevant for Teaching and Addressing Environmental Conservation and Climate Chang. *Afr. J. Res. Math. Sci. Technol. Educ.* **2024**, *28*, 389–403. [CrossRef]
24. Euba, A. *Yoruba Drumming: The Dundun Tradition*; Iwalewa-Haus: Bayreuth, Germany, 1990.
25. Dillard, M. Oral History and Life History as Sources. In *Oxford Research Encyclopedia of African History*; Spear, T., Ed.; Oxford Academic: Oxford, UK, 27 February 2017. [CrossRef]
26. Gebrekistos, A.; Birhane, E. The War on Tigray Wiped Out Decades of Environmental Progress. How to Start Again. 2023. Available online: https://www.globalcitizen.org/en/content/tigray-environment-progress-conflict-agriculture/ (accessed on 15 August 2026).
27. Njoh, A.J.; Bigon, L. Germany and the Deployment of Urban Planning to Create, Reinforce and Maintain Power in Colonial Cameroon. *Habitat Int.* **2015**, *49*, 10–20.
28. Ormsby, A. *Cultural and Conservation Values of Sacred Forests in Ghana*; Cambridge University Press: Cambridge, UK, 2007.
29. Richards, P. *Indigenous Agricultural Revolution: Ecology and Food Production in West Africa*; Hutchinson: London, UK, 1985.
30. Republic of Cameroon. *Land Tenure and State Lands*; National Printing Press: Yaounde, Cameroon, 2013.
31. Telila, H.; Kumsa, L.; Totoba, B.A. A Review on Oromo Traditional Ecological Knowledge: A Beacon for Sustainable. *J. Equity Sci. Sustain. Dev.* **2025**, *8*, 162–185.
32. Baxter, P.T.W.; Hultin, J.; Triulzi, A. (Eds.) *Being and Becoming Oromo: Historical and Anthropological Enquiries*; Red Sea Press, Inc.: Lawrenceville, NJ, USA, 1996.
33. Shipton, P. *Mortgaging the Ancestors: Ideologies of Attachment in Africa*; Yale University Press: New Haven, CT, USA; London, UK, 2009.
34. Ubink, J.M. *In the Land of the Chiefs: Customary Law, Land Conflicts, and the Role of the State in Peri-Urban Ghana*; Leiden University Press: Leiden, The Netherlands, 2008.
35. Berry, S. *No Condition is Permanent: The Social Dynamics of Agrarian Change in Sub-Saharan Africa*; University of Wisconsin Press: Madison, WI, USA, 1993.
36. Boone, C. *Property and Political Order in Africa. Land Rights and the Structure of Politics*; Cambridge University Press: New York, NY, USA, 2014.
37. LAHIS. International Scientific Newort (LAHIS) (Late Antique Hilltop Settlements in Europe). 2026. Available online: https://lahis.badw.de/en/network.html (accessed on 15 August 2026).
38. Orozco, M.; Lapointe, M. Mexican Hometown Associations and Development Opportunities. *J. Int. Aff.* **2004**, *57*, 31–49.
39. Mercer, C.; Page, B.; Evans, M. *Development and the African Diaspora: Place and the Politics of Home*; Zed Books: London, UK, 2008.
40. Chambers, R. *Rural Development: Putting the Last First*; Longman: London, UK, 1983; Volume 198.
41. Ostrom, E. *Governing the Commons: The Evolution of Institutions for Collective Action*; Cambridge University Press: Cambridge, UK, 1990.
42. Kiribou, R.; Bedadi, B.; Dimobe, K.; Ndemere, J.; Neya, T.; Ouedraogo, V.; Dejene, S.W. Urban farming system and food security in sub-Saharan Africa: Analysis of the current status and challenges. *Urban Agric. Reg. Food Syst.* **2024**, *9*, e70007. [CrossRef]
43. Polanyi, K. *The Great Transformation: The Political and Economic Origins of Our Time*; Beacon Press: Boston, MA, USA, 1944.
44. Mamdani, M. *Citizen and Subject: Contemporary Africa and the Legacy of Late Colonialism*; Princeton University Press: Princeton, NJ, USA, 1996.
45. Scott, J.C. *Seeing Like a State*; Yale University Press: New Haven, GT, USA; London, UK, 1998.
46. Ferguson, J. *Global Shadows: Africa in the Neoliberal World Order*; Duke University Press: Durham, NC, USA, 2006.
47. Lubkemann, S. Involuntary Immobility: On a Theoretical Invisibility in Forced Migration Studies. *J. Refug. Stud.* **2008**, *21*, 454–475. [CrossRef]
48. Altieri, M.A. *Agroecology: The Science of Sustainable Agriculture*, 2nd ed.; CRC Press: Boca Raton, FL, USA, 2018. [CrossRef]
49. Pretty, J.; Toulmin, C.; Williams, S. Sustainable intensification in African agriculture. *Int. J. Agric. Sustain.* **2011**, *9*, 5–24. [CrossRef]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.