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Indian Institute of Management Calcutta, India

*CORRESPONDENCE
Daniel Boamah Asante
✉ daniel.asante@unb.ca

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Combating the global environmental crisis using indigenous ecological knowledge: the case of Kwahu traditional area, Ghana

Daniel Boamah Asante[1,2]*, Dickson Adom[3], Afua Asante[1] and Vera Gyamera[4]

[1]Department of Sociology, Faculty of Management, University of New Brunswick Fredericton, Fredericton, NB, Canada, [2]School of Religion, Queen's University, Kingston, ON, Canada, [3]Department of Educational Innovations in Science and Technology, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, [4]Department of English, University of Media Arts and Communication, Accra, Ghana

This study explores Indigenous ecological knowledge from the Kwahu Traditional Area in Ghana as a compelling case study amid an escalating global environmental crisis. It reassesses traditional environmental conservation, emphasizing the intricate practices that sustain the Kwahu people's harmonious relationship with their natural environment. The study focuses on the Kwahu people's indigenous methods of environmental regulation, including their reverence for totemic animals, traditional understanding of land and water bodies, and observance of sacred or taboo days. The findings demonstrate that the Kwahu people's reverence for totemic creatures acts as ecological custodians, reflecting the interconnectedness of human and non-human realms. Moreover, the study reveals the Kwahu's unique and holistic understanding of land and water bodies, showing how these perceptions contribute to sustainable land use and resource management, enhancing ecological resilience. Additionally, observance of sacred or taboo days is crucial to the Kwahu's Indigenous environmental management, blending nature's spiritual and ecological aspects. These designated days provide periods of rest for the natural world and illustrate the deep respect the Kwahu people have for nature. By examining and illuminating these Indigenous conservation practices, the study emphasizes their ongoing relevance amid urgent global environmental challenges. The study offers valuable insights into how Indigenous ecological knowledge systems can inform and complement contemporary environmental conservation efforts, presenting a holistic and culturally rooted approach to addressing the complex environmental crises facing our planet. In this regard, Indigenous ecological practices often incorporate ecological, cultural, social, and spiritual components, which provide a holistic understanding of ecosystems. This perspective is crucial for enhancing modern conservation efforts as it recognizes the interconnectedness of humans and nature.

KEYWORDS

biodiversity conservation, cultural heritage preservation, environmental crisis, Ghana, indigenous ecological knowledge, Kwahu

1 Introduction

Indigenous Ecological Knowledge (IEK) is a comprehensive repository of knowledge, beliefs, and practices developed through adaptive processes and transmitted culturally across generations. This knowledge framework intricately maps the relationships between living entities, including humans, their rich cultural heritage, and their environments (McCarter et al., 2014; Adom, 2022). However, the rise of globalization, with its emphasis on modern science and technology, has either led to the integration of IEK into the Western paradigm of 'knowledge for sustainable development' (Briggs and Sharp, 2004; Adom, 2021; Skerrett, 2023) or its marginalization (Agrawal, 2014; Khumalo and Baloyi, 2017; Petzold et al., 2020). Despite historical oversight, Indigenous communities have long recognized the value of their knowledge systems in managing environmental changes effectively (Adams et al., 2014; Ford et al., 2020). There is growing evidence that diverse solutions are crucial for navigating the complexities of social-ecological systems (Ostrom et al., 2007). IEK stands out as a vital source of innovative local environmental insights (Berkes, 2017). Beyond its role as a repository for complex ecological information (Johannes, 1998), it serves as a foundational element for formulating effective management strategies (Fernandez-Gimenez, 2000) and holds profound significance as a catalyst for shaping people-centered approaches to resource governance (Ross et al., 2016; Adom, 2021). This recognition highlights IEK's role not just as an information reservoir but also as a means to enhance resilience and equitable governance in natural resource management.

The onset of colonialism represented a crucial turning point for Indigenous populations, subjecting them to diverse forms of assimilation and triggering significant changes in land use, resource distribution, and resettlement (Grim, 2001; Berkes, 2017). Despite the subsequent era characterized by global expansion, population growth, and increased political tensions, numerous Indigenous communities continue to uphold their ancestral beliefs and practices, fostering a resilient and mutually beneficial bond with the environment (Ross et al., 2016; Adom, 2022). Modern approaches to addressing environmental issues in Africa do not represent the inception of environmental protection on the continent. Long before colonization and subsequent independence, environmental preservation was deeply embedded in African religious, cultural, and social life (Amechi, 2010). In particular, Indigenous Ghanaian communities have long depended on traditional customs and values that historically played a crucial role in protecting the environment (Adom, 2018a; Asante, 2015; Awuah-Nyamekye, 2014a, 2014b). Drawing on a case study of Indigenous ecological knowledge in the Kwahu Traditional Area in Ghana, this study reevaluates the concept of Indigenous environmental conservation in the face of a global crisis. It highlights the Kwahu people's Indigenous environmental regulation methods, focusing on key practices like reverence for totemic animals, traditional knowledge of land and water bodies, and observance of sacred or taboo days. Furthermore, it emphasizes their significance in contemporary global environmental conservation efforts. The present study is guided by the following research questions:

1. What are the Indigenous environmental conservation strategies employed by the Kwahu people?
2. How do the worldviews of the Kwahu people shape and guide the Indigenous environmental conservation strategies?
3. How do the Indigenous environmental conservation strategies of the Kwahu people contribute to ongoing global conservation efforts?

1.1 Indigenous ecological stewardship

Indigenous peoples, the original inhabitants of many regions worldwide, possess deep-rooted cultural and ecological knowledge systems distinct from dominant global paradigms (Dudgeon and Berkes, 2003). Their strong spiritual and material relationships with nature form the basis of their environmental management practices, which are often misunderstood or undervalued by external systems of thought (Ross et al., 2016; Jamieson, 2008). Although colonialism and subsequent globalization efforts have attempted to undermine or assimilate these systems (Grim, 2001; Berkes, 2017), many Indigenous communities continue to maintain a reciprocal relationship with their environments through enduring spiritual and cultural frameworks (Adom, 2018a, 2018b).

The term "Indigenous knowledge" is frequently used interchangeably with "traditional knowledge," referring to insights rooted in long-standing relationships with place, often transmitted orally across generations. These knowledge systems are inherently adaptive, empirically informed, and spiritually grounded, offering valuable insights for sustainable environmental stewardship (Berkes, 2017). Rather than being static or anti-modern, traditional ecological knowledge (TEK) is dynamic and empirical in nature, grounded in lived experience, and adjusted over time in response to ecological feedback (Salmon, 2000; Mazzocchi, 2020). TEK not only informs practices such as crop rotation, sacred site protection, and seasonal resource use but also incorporates ethical and cosmological principles embedded in stories, rituals, and taboos (Rose et al., 2002; Awuah-Nyamekye, 2014a, 2014b).

Contrary to longstanding perceptions that position traditional knowledge as incompatible with modern science, a growing body of literature argues for recognizing both as valid and potentially complementary systems of knowing (Agrawal, 1995; Mazzocchi, 2006; Nadasdy, 1999). Scholars have increasingly challenged the binary opposition of "traditional" versus "modern," instead proposing that knowledge systems should be evaluated on the basis of contextual efficacy, relevance, and ethical grounding. Agrawal (1995) critiques the categorization of knowledge as either "scientific" or "Indigenous," advocating for a more integrative and inclusive epistemology that acknowledges overlaps and shared objectives. Similarly, Nadasdy (1999) warns against tokenistic incorporation of Indigenous knowledge into Western policy frameworks without understanding the sociocultural contexts that give it meaning.

In the field of environmental conservation, this critique has become particularly salient. As Berkes (2017) notes, Indigenous practices often mirror the principles of adaptive management—a key concept in Western ecological science—yet they are informed by spiritual understandings and relational worldviews that modern science typically eschews. The International Union for Conservation of Nature (IUCN) has acknowledged the role of traditional and spiritual practices in shaping effective conservation outcomes (Dudley et al., 2009). Case studies from diverse regions—such as the Kwahu in Ghana, the Yanyuwa in Australia, and the Karen in Thailand—reveal the practical and spiritual depth of local ecological practices and

challenge the narrow application of Western ecological models (Ross et al., 2016; McNiven, 2004; Aniah et al., 2014).

In the Kwahu Traditional Area of Ghana, for example, local environmental governance is intricately tied to belief systems that revere sacred groves, totemic animals, and ancestral spirits. These practices are not merely symbolic but serve critical ecological functions by regulating hunting, protecting biodiversity, and conserving water sources. The view of the earth as a sacred, living entity—often personified as a mother—is not unique to Kwahu culture but is shared by many Indigenous communities globally. Nonetheless, the specific expressions of this worldview, and the rituals and taboos it engenders, are culturally distinct and highly adapted to local ecological conditions (Awuah-Nyamekye, 2014a, 2014b; Berkes, 2017).

Understanding the challenges facing Indigenous ecological systems, particularly in the context of policy imposition and environmental degradation, requires moving beyond the simplistic "traditional versus modern" dichotomy. As Aniah et al. (2014) argue, modern development paradigms often ignore or marginalize Indigenous knowledge systems, favoring Western scientific models that may be ill-suited to local contexts. These top-down approaches are frequently influenced by ideologies rooted in Christian eschatology and Western economic rationalism (Jenkins, 2013), further displacing Indigenous values and cosmologies that emphasize balance and interdependence.

This study builds on a framework that recognizes Indigenous ecological knowledge not as a relic of the past, but as a living, adaptive system that continues to offer meaningful contributions to global environmental sustainability. By situating Kwahu ecological practices within broader theoretical debates, it becomes evident that these knowledge systems not only challenge the artificial divide between science and tradition but also offer pathways toward a more inclusive, pluralistic understanding of conservation.

2 Worldview and environmental ethos

Extensive research has revealed that the behaviors of various indigenous cultures are founded upon their unique worldview (Tucker and Grim, 2009), or cosmovision (Haverkort and Reijntjes, 2017; Millar, 1999). Ethnologist Edward Sapir defines worldview as a combination of thought patterns, attitudes towards life, conceptions of time, mental imagery of a people's relationship to unseen entities and the order of things, as well as their view of self and others (Sapir, 1968 p. 548). Similarly, Richard Foltz characterizes worldview as the lens through which individuals or groups perceive their world and their role within it (Foltz, 2003, p. 2). Essentially, a worldview is a set of fundamental beliefs that a group of people uses to understand their reality and their purpose in the world. As Mkhize notes, worldviews are more than abstract concepts; they are deeply ingrained in human values, attitudes, opinions, evaluations, and behaviors. They reflect an unbreakable link between an individual, their environment, and their historical context, firmly rooted within their cultural setting (Mkhize, 2004, p. 25).

Discussing the Kwahu people's worldview means delving into their conscious and subconscious beliefs about their world and their position within it. These beliefs frame their perception of reality, influencing their interactions with the natural world. Their worldview aligns with Charles Kraft's conceptualization of worldview as a mental map or lens for interpreting life and the environment (Kraft, 2003, p.22), driven by a religious perspective that places God (Onyame), deities, ancestors, and lesser gods at the core of their understanding of the universe. This view not only shapes their identity and environmental attitudes but also aligns with findings across Africa, recognizing a spiritual dimension in worldviews that emphasizes God's[1] omnipresence and the divine creation of nature (Gumo et al., 2012; Omare, 2006). The profound belief in God as the ultimate creator of the universe fosters a deep reverence and respect for all of creation, including fauna, rivers, woodlands, mountains, and geological formations, among other natural phenomena. This reverence explains the significance of venerating specific geographic locations and the prohibition of certain behaviors. Such practices stem from the belief that these natural elements harbor spiritual essences, which are integral to the interconnected and symbiotic relationship between humanity and the natural world (Sibanda, 1997).

Olsen and colleagues point out the coexistence of "dominant" and "alternative" worldviews within societies, with dominant ones shaping the collective interpretation of experiences and social realities. However, these dominant views are dynamic, potentially evolving over time and giving rise to alternative perspectives. The influence of Western education and culture exemplifies such transformations, leading to shifts in indigenous worldviews by challenging indigenous values, promoting Western science, and undermining local beliefs, with significant implications for social and ecological stewardship (Appiah-Opoku, 2007; Awuah-Nyamekye, 2014a, 2014b). The current research reveals a complex relationship between the Kwahu people and their environment, noting how Western influences have introduced alternative worldviews to traditional African ones. The interaction between these dominant and alternative views, particularly in the Kwahu Traditional Area, mirrors similar dynamics in other indigenous societies, highlighting the resilience of traditional worldviews against Western encroachment. Our fieldwork among the Kwahu people confirms the continued vitality of their worldview, revealing a balanced coexistence of traditional and alternative perspectives that foster a rich, knowledge-based understanding of the universe and its place within it. These shifts demonstrate that Indigenous ecological knowledge in Kwahu has never existed in isolation. The spread of Christianity, Western education, and the establishment of state conservation bodies have introduced new epistemic frameworks that interact with local worldviews. For instance, prohibitions on hunting in sacred groves are now often reframed by state actors as biodiversity protection, while Christian converts sometimes reinterpret taboos through biblical stewardship ethics. This hybridity underscores the relational character of knowledge: Kwahu practices today are shaped not by a binary between "local" and "global," but by ongoing negotiations across knowledge systems (Sillitoe, 2007; Mazzocchi, 2020).

1 In this context, "God" refers to the Supreme Being in traditional African religious cosmology. Among many Indigenous communities, including the Kwahu people, this deity is understood as the creator and sustainer of life, often conceived as omnipotent and benevolent, but distinct from the Judeo-Christian God in terms of associated rituals, names, and cultural expressions.

3 Materials and methods

3.1 Research design

This study delved into a variety of topics, exploring the Kwahu people's cosmology, their views on environmental conditions within the Kwahu Traditional Area, and the unique blend of cultural, traditional, and religious strategies they utilize for environmental preservation. Primarily drawing upon verbal data provided by respondents, who utilized both textual and visual descriptions to articulate their perspectives, the study was firmly rooted in a qualitative research approach (Bouma et al., 2008; Bryman, 2016; Creswell, 2003).

3.2 Research method and sampling procedures

This study sought to elucidate the indigenous knowledge and practices utilized for environmental conservation within the Kwahu Traditional Area (Figure 1). Employing semi-structured interviews, the research team engaged with traditional rulers, herbalists, farmers, traditional priests and priestesses, caretakers of sacred groves, foresters, and environmental protection officials, among others. The aim was to navigate the social world (Bouma et al., 2008) from the perspectives of those deeply embedded in it, capturing their distinct views and reflective insights. By gathering rich, descriptive accounts of the Kwahu people's indigenous environmental strategies, the research provided a deep dive into their socio-cultural context, ensuring an empathetic understanding while striving to limit the researchers' interpretive influence on the outcomes (Bryman, 2016). While our sampling sought to capture the perspectives of diverse actors—chiefs, priests, farmers, foresters, and EPA officials—we acknowledge that these groups occupy different positions of authority in relation to environmental governance. As Agrawal (1995) and Nadasdy (1999) caution, the politics of knowledge is not neutral: whose knowledge counts is shaped by social hierarchies and institutional power. For example, chiefs and sacred grove attendants are seen as custodians of spiritual knowledge, while state officials rely on technical expertise and regulatory authority. By foregrounding this plurality, we recognize that Indigenous ecological knowledge in Kwahu is not monolithic but negotiated through power relations within the community and between local and state actors. The study participants were purposively selected (Bryman, 2016; Fraenkel et al., 2012) based on various criteria, such as their expertise, experience, and roles within their communities, especially those with direct involvement in environmental matters. A total of 89 respondents took part in the study (see Table 1), a sample size deemed appropriate as data saturation can typically be achieved with as few as 10 participants (Boyd, 2001). Ethical considerations in research played a pivotal role in defining the boundaries of legitimacy and establishing the moral principles inherent in this research endeavor (Neuman, 2014). To uphold ethical standards, all study participants were required to sign an informed consent form. This document outlined the rationale for the research, its procedures, associated risks and benefits, the voluntary nature of participation, participants' rights to withdraw from the study at any point, and measures to safeguard the confidentiality of their identities and opinions (Bailey, 1996). For participants who were unable to read or write, the researchers verbally communicated the contents of the consent form, allowing them to provide oral consent. Participants were assured of anonymity and informed that their feedback would be utilized solely for research purposes.

3.3 Data collection tools and procedure

Two data collection methods were utilized: Personal Interviews and Focus Group Discussions. Personal interviews enabled the researchers to obtain in-depth descriptions and insights (Fraenkel et al., 2012) into the indigenous conservation strategies employed within the study area. Furthermore, input from environmental protection officials and local authorities provided valuable perspectives on the successes, challenges, and lessons learned from implementing indigenous conservation practices in contemporary society (Tran et al., 2020). Tailored semi-structured interview guides were meticulously developed for each category of study participants, including traditional rulers, foresters, environmental activist groups, and sacred grove attendants, among others. These guides underwent pilot testing with a subset of the sample and were reviewed by two experienced phenomenology researchers, whose feedback and suggestions were incorporated into the final versions.

3.4 Data analysis

Qualitative Content Analysis was employed to analyze the audio-recorded personal interviews and interpret the video-recorded focus group discussions (Bryman, 2016). The initial step in the analytical process involved transcribing the perspectives of all participants referred to as the emic perspective by Smith and Osborn (2008). The researchers meticulously listened to the interviews to capture the precise words and phrases of the interviewees, aiming to develop a comprehensive understanding—the gestalt (Hycner, 1999)—in order to authentically represent their voices through extensive quoting. The researchers consciously bracketed their personal views and biases. Subsequently, member checking was conducted with key participants after transcription to ensure the validity and accuracy of the collected data (Leedy and Ormrod, 2010). Statements that directly addressed the research questions were thoughtfully examined and extracted to provide interpretations (Hycner, 1999). The frequency of specific viewpoints expressed was considered highly significant to the research questions and was deemed crucial in providing preliminary answers to those questions. This phase corresponds to the etic perspective (Smith and Osborn, 2008). The meanings extracted from these viewpoints were examined in light of established theories and perspectives presented in scholarly publications from reputable academic sources. Subsequently, a comprehensive synthesis of novel insights regarding indigenous strategies for environmental conservation and their implications for global conservation efforts was compiled.

3.5 Study area

This study was conducted in the Kwahu Traditional Area of Ghana, covering 16 towns and villages. The research took place over

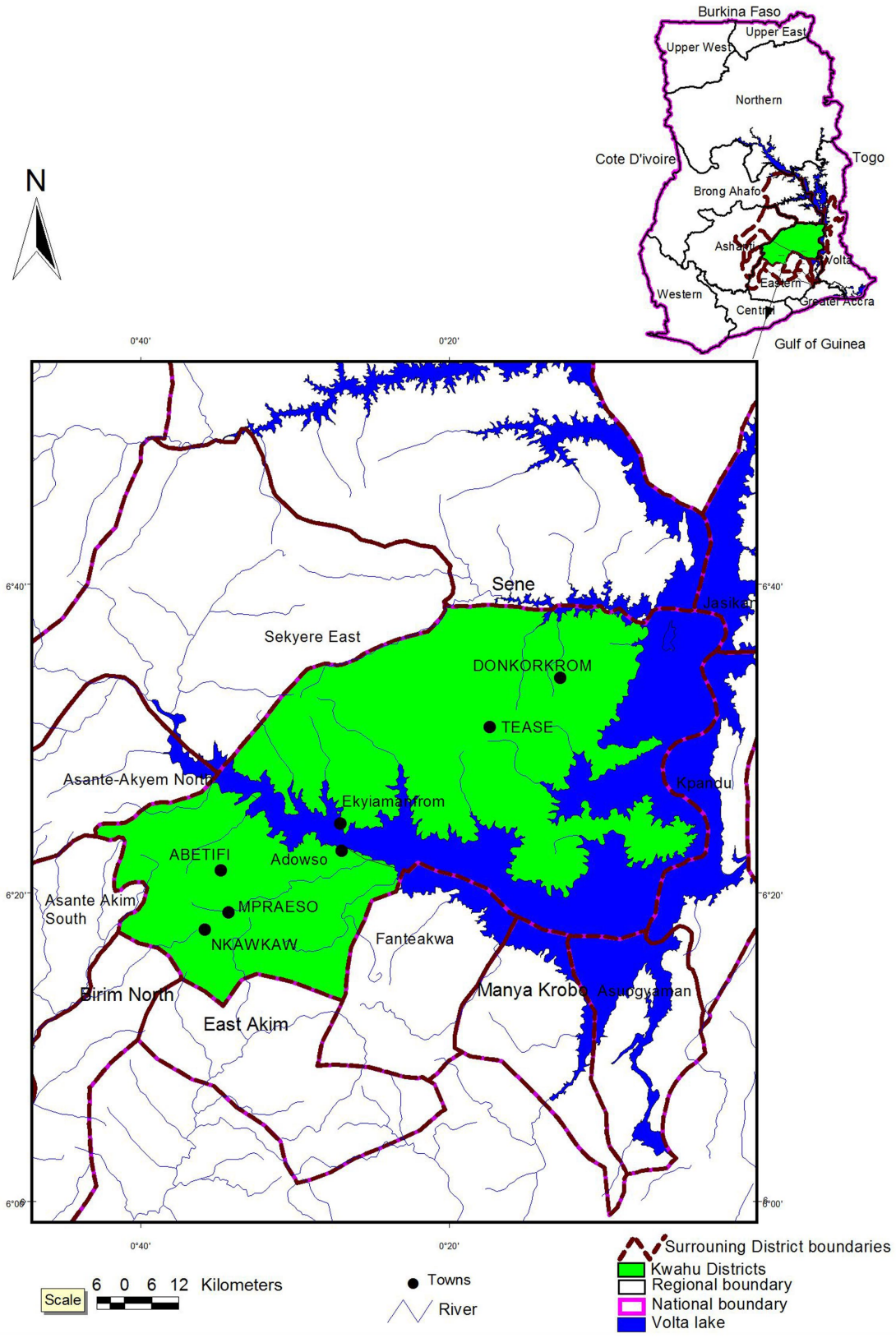

FIGURE 1
Map of Kwahu traditional area. Source: RMSC, Kumasi.

TABLE 1 Breakdown of interviews.

No.	Category of participants	Total No. selected
1	Traditional rulers (chiefs, queens-mothers)	14
2	Traditional priests and priestesses	9
3	Christian priests	7
4	Sheiks	4
5	Family heads and elders	13
6	Farmers, hunters, charcoal producers, sand winners, fishers, herbalists	21
7	Foresters	6
8	Officials of the Environmental Protection Agency (EPA)	4
9	Environmental activist groups (NGOs)	3
10	Sacred grove attendants	8

Total sampled respondents = 89 (23 females, 66 males).

26 months, from June 2017 to August 2019. The Kwahu Traditional Area is located in the Eastern Region of Ghana, and its geographical coordinates span from 1° West to 0° 15′East longitude, and from 6° 30′ to 7° 15' North latitude. This region is known for its rich historical and cultural significance, with distinct boundaries defined by the river *Obosom* to the north and the river *Volta* to the east. These natural waterways not only shape the landscape but also contribute to its ecological diversity and vitality. The Kwahu Traditional Area is located in the Semi-Deciduous Forest zone, which is renowned for its abundant vegetation and trees that shed leaves during dry seasons. The forest is structured into upper, middle, and lower canopy levels, and is home to economically valuable trees such as Odum, Wawa, and Sapele, showcasing the area's diverse flora. Encompassing 37,070 hectares, Kwahu is home to five major forest reserves: Southern Scarp Forest, Oworobong South, Abisu, Northern Scarp West, and Oworobong North Forest. These reserves are crucial for their mineral resources and biodiversity, including species with significant medicinal and scientific importance. The geography of the Kwahu Traditional Area is characterized by striking differences, with lowlands next to towering mountains. This terrain consists of three distinct physiographic regions: the Southern Plateau, the Forest Dissected Plateau, and the Plains, gradually merging into the Southern Voltarian Plateau. Elevation levels range from 60 meters to 150 meters above sea level, culminating in the imposing Kwahu scarp, which rises from 220 meters to an impressive 640 meters above sea level. Two prominent mountains, Apaku and Odwenanoma, further define the landscape with their imposing presence. Climatically, the Kwahu Traditional Area falls within the West Semi-Equatorial climatic region, characterized by a bimodal precipitation pattern. Annually, the region receives an average rainfall ranging between 1,580 mm and 1780 mm. The primary rainy season spans from April to July, followed by a secondary, albeit less intense, rainy period from September to October. In contrast, the dry season, known locally as Harmattan, prevails from December to March, accompanied by hot, arid winds laden with dust. During this period, grasslands take on a desiccated appearance, riverbeds and streams dwindle, and many trees shed their leaves, casting a russet hue across the landscape.

In addition to its rich ecological and physical characteristics, the Kwahu Traditional Area possesses a vibrant socio-cultural and agrarian profile that is deeply interwoven with its environmental practices. Social organization in the region is primarily based on extended families and matrilineal clans, with traditional chieftaincy institutions serving as the custodians of communal land and playing a central role in governance, conflict resolution, and resource management. These institutions are not only administrative but also cultural, reinforcing communal identity and stewardship over natural resources. Traditional spiritual beliefs remain influential in shaping environmental ethics, as reflected in widespread reverence for sacred groves, totemic animals, and the observance of taboo days, which function both as ecological safeguards and expressions of cosmological respect. Economically, agriculture is the dominant livelihood activity, practiced largely at the subsistence and smallholder levels. The region's fertile semi-deciduous forest soils support a diverse range of staple crops such as maize, cassava, cocoyam, plantain, and yam, along with cash crops including cocoa and oil palm. Livestock rearing, artisanal fishing, and hunting also contribute to household incomes, although to a lesser degree. Farming practices are often guided by Indigenous ecological knowledge, including techniques such as intercropping, crop rotation, and fallowing, which promote soil fertility and sustainable land use. Local markets—particularly in towns such as Nkawkaw, Mpraeso, Abetifi, and Atibie—serve as important hubs for the exchange of agricultural goods, linking local production systems with broader regional economic networks.

4 Presentation and discussion of findings

This section presents findings on the indigenous environmental conservation strategies employed by the Kwahu people, how their worldviews shape and guide their indigenous environmental conservation strategies, and how these worldviews contribute to ongoing global conservation efforts.

4.1 Kwahu indigenous environmental conservation strategies

The Kwahu people have a deep understanding of biodiversity and the delicate balance between humans and the natural world. This knowledge is the foundation of their traditional environmental preservation practices, which are similar to those found in other African societies (Adom, 2018a, 2018b; Asante, 2015; Awuah-Nyamekye, 2014a, 2014b). Their worldview emphasizes the interdependence of human existence and the need to protect biodiversity, which the people of the Kwahu Traditional Area consider a sacred duty. This responsibility is not merely a secular obligation but is deeply imbued with religious significance, as every aspect of their environment holds profound spiritual importance within Akan cosmology (Anane, 2003). Drawing from this rich ontological foundation, the Kwahu people have implemented a range of conservation efforts, including their belief in totemic animals

(*ntonmoa*), their traditional conceptualization of land (*Asaase Yaa*) and water bodies (*nsuo*), and their observance of sacred or taboo days (*nnabóne*).

4.1.1 The belief in totemic animals (Ntonmoa)

The preservation of nature is an important aspect of traditional Kwahu culture, and totemic animals play a significant role in this practice. The Akan term for these animals is *ntonmoa*. As Sigmund Freud noted, a totem is "an animal, either edible or harmless, or dangerous and feared, …which stands in a peculiar relation to the whole clan. The totem is first of all the tribal ancestor of the clan, as well as its tutelary spirit and protector; it sends oracles and, though otherwise dangerous, the totem knows and spares its children" (Freud, 1913, p. 2). The Kwahu people have a rich cultural tradition centered around the concept of totemism, which is encapsulated by the term "ntonmoa." This Akan word refers to an animal that serves as an emblem or symbol for a particular clan. Certain birds and other animals are considered inviolable totems that must not be harmed, killed, touched, or consumed due to their deep religious significance. These beliefs and practices are fundamental to Kwahu culture, which emphasizes the unity between humanity and the natural environment. This interconnected and mutually reliant comprehension of the natural world finds expression in a renowned indigenous adage: *We are the environment, and the environment is us: we are united and identified with nature* (Tosam, 2019, p.179). The Kwahu people, like many other Akan societies, believe in spiritual forces that manifest in the human world through spirit-possessed animals, including totems. They also believe that natural elements house or possess their own spirits, which elevates their view of nature beyond the physical realm. This perspective on nature underscores the essential spiritual connection between humankind and the natural world, which is exemplified in the practice of totemism.

In traditional Kwahu society, it is widely believed that totemic animals have a sacred bond with clan members and their ancestors. These animals are believed to house ancestral spirits, making it crucial to protect them from harm or consumption. Infringing upon the sanctity of totemic animals is considered a sacrilegious act, and the community collectively advocates for their protection. As a key informant explained:

> "As the survival of our clan is tied to the well-being of our totemic creatures, each of us holds a sacred duty to protect them. Our ancestors' spirits reside within these creatures, and any harm to them could anger our forebears and bring misfortune upon us" (N.A. Serebour, personal communication, July 05, 2017).

Another elder commented:

> "You may not see it immediately, but harming your clan's totem is like turning your back on your family. It invites disgrace and tragedy" (Elder Kojo Mensah, personal communication, July 05, 2017).

During a personal interview with a traditional Priestess, we gained insight into the historical impact of unintentionally causing the extinction of a totemic animal. The prevailing practice involved a series of meticulous ceremonies aimed at conveying respect and appeasing ancestral, divine, and spiritual entities. These entities were believed to harbor disquiet that the rituals sought to mitigate by showing reverence to the deceased animal. The buffalo (ékoó), parrot (ako), and leopard (ósebó) were specifically referenced within this elaborate ritualistic framework (Okomfo Agyeiwaa, personal communication November 05, 2017). Hunters we spoke with emphasized the utmost care taken to avoid killing any totemic animals, highlighting the deep connection between clans and their designated creatures. In a personal interview, a hunter disclosed:

> "In some communities, certain animals are believed to be related to them in a special way. These animals are considered sacred, and it is forbidden to hunt or harm them. It is believed that doing so can bring bad luck or disaster to the community. So, people are very careful during hunting not to harm these special animals" (A hunter–personal communication, August 12, 2019).

Another hunter added:

> "Before we go out to hunt, we remind ourselves: if we see a totem, we pass. No matter how hungry we are or how rare the animal is, we respect the taboo" (Personal Communication, August 12, 2019).

The significance of *ntonmoa* in the Kwahu Traditional Area cannot be overstated. The killing of this totemic animal represents a grave threat to the existence of the entire clan, as ntonmoa is revered as a direct descendant of their common ancestor. As a result, community members must uphold their responsibility to protect and preserve totemic animals. Table 2 provides examples of eight distinct clans in the study area and their respective totems, compiled from our interviews with key informants.

The human-nature relationship (Kim et al., 2023; Hawken and Granoff, 2010) exemplified by totemism, adds an ethical layer to the interaction with various animal species. In the Kwahu traditional community, this ethical importance is emphasized through specific prohibitions and taboos. These rules are crafted to foster a respectful and responsible connection with totemic animals. In agreement with other studies, both in Ghana and beyond, adherence to these prohibitions—especially against killing, consuming, or harming totemic animals—is often strict, playing a crucial role in environmental conservation (Awuah-Nyamekye, 2014a, 2014b; Bobo et al., 2015; Landim et al., 2023). Thus, the relationship between the Kwahu people and nature reflects the socio-ecological dimension of totemism.

TABLE 2 Kwahu Clans and their totemic animals.

Clan	Totem	Symbolic meaning
Aduana	Dog	Friendliness
Asakyiri	Vulture	Calmness and Intelligence
Agona	Parrot	Eloquence
Asona	Crow	Statesmanship and Patriotism
Asenie	Bat	Diplomacy and Faithfulness
Bretuo	Leopard	Assertiveness and Bravery
Ekoóna	Buffalo	Honesty and Uprightness
Oyóko	Hawk	Patience and Bravery

Totemism among the Kwahu people has traditionally served to imbue specific clans with religious and cultural identity. However, its broader ecological function lies in the regulation of human interaction with certain animal species, thereby contributing to environmental conservation. Totemic animals are venerated for their perceived spiritual connection, and any harm inflicted upon them is believed to provoke serious supernatural repercussions, including illness or death. This belief system, grounded in indigenous cosmology, is strongly upheld by both elders and traditional authorities. One elder noted:

> "As a society, we have a collective responsibility to safeguard totemic animals, not only for their survival but also for the well-being of future generations" (Nana Agyeman, personal communication, July 2017).

He, like many of his peers, saw totemic animals as essential to the survival of various species and the balance of the natural world. He believes that safeguarding these animals:

> "…could ensure their ongoing contribution to the ecosystem and inspire future generations to appreciate and value the natural world" (Nana Agyeman, personal communication, July 2017).

The expression, *If we fail to protect totemic animals, we risk hastening their extinction and betraying future generations* was a popular phrase from the elderly respondents. This sentiment is rooted in the African cultural values that emphasize that decisions made today must consider the needs of the future.

The study clearly shows that people's cognitive motivations, rooted in their cultural beliefs (Adom and Asante, 2020), lead them to recognize the importance of protecting totemic animals to prevent their extinction and increase their population, as per Awuah-Nyamekye (2014a, 2014b), Landim et al. (2023), Clemence and Chimininge (2015) and Diawuo and Issifu (2017), who theorize that the associated dread of coming into contact with totemic animals leads to an effective avoidance of human intervention, thereby facilitating the preservation of animal species and their natural habitats. In this context, it becomes evident how the Kwahu people have adeptly translated their theoretical worldview into a practical ethical framework. Through a series of fundamental actions and the underpinning assumptions regarding the universe, the application of totemism has evolved into a structured strategy that not only fosters the preservation of traditional environmental practices but also actively promotes their adherence within the Kwahu community.

4.2 The conception of land (Asaase Yaa) and water bodies (Nsuo)

4.2.1 Land (Asaase Yaa)

In the Kwahu and various Akan communities, the earth is held in high esteem and referred to as "Asaase Yaa" (Boaten, 1998; Larbi, 2002). Within Kwahu cosmology, the land embodies both a divine goddess and a nurturing mother figure. The term "Asaase Yaa" is a combination of "Asaase," signifying Earth or Land, and "Yaa," which designates a female born on a Thursday by Akan tradition. This naming showcases the deep reverence and connection to the earth in these societies. "Asaase Yaa" is honored as Mother Earth, representing fertility, and serving as a reliable guardian of truth (Konadu, 2010; Sarfo-Mensah and Oduro, 2007).

This distinctive interpretation of the concept of land, as it emerges from the worldview of the Kwahu people, has yielded a significant revelation in the context of this present study. It underscores the profound tendency of the Kwahu people to anthropomorphize a broad spectrum of non-human entities, with the land taking center stage in this phenomenon. This aligns with the concept of anthropomorphism, which, in its most comprehensive form, is defined as "the attribution of human traits to non-human entities" (Meredith Root-Bernstein et al., 2013, p. 1578). This multifaceted phenomenon encompasses a spectrum of manifestations, ranging from the identification of parallels between humans and anthropomorphized non-human entities to a form of anthropomorphism wherein individuals embrace the personal belief that these anthropomorphized objects exhibit human-like characteristics and traits (Meredith Root-Bernstein et al., 2013). Existing scholarly discourse primarily explores the attribution of human traits to non-human entities within the context of animal species (Antonacopoulos and Pychyl, 2008; Manfredo, 2008). However, the empirical evidence emerging from the present study area echoes a broader indigenous philosophy that deepens our understanding of environmental ethics, wherein non-animal objects, exemplified by the land, seamlessly fit into the nuanced frameworks that facilitate the comparison between humans and non-humans, and the subsequent assignment of human characteristics and traits to non-human entities. Within the cultural fabric of the Kwahu people, the land is distinctly personified as maternal. Central to this characterization is the role of women, particularly mothers, who are the primary caregivers in traditional Kwahu society and many Ghanaian communities. A prominent queen mother in the study area emphasizes this deep connection:

> The connection between the Kwahu people and the Earth as a mother becomes evident when viewed through the roles of women in our society. Women foster societal growth through childbirth and child-rearing and play a crucial role in food production, a cornerstone of human sustenance. To the Kwahu people, the Earth mirrors these functions. While we are alive, we cultivate the land to produce the food that sustains us, and when our journey on Earth concludes, the land embraces us, offering a final resting place (Janet Afriyie, personal communication, July 12, 2018).

Another elderly woman from Mpraeso remarked:

> "A mother watches over her children with care and patience. That is how we see Asaase Yaa—she feeds us, shelters us, and carries our dead when their time has come" (Ama Serwaa, personal communication, July 10, 2018).

The above excerpts underscore the anthropomorphic perceptions prevalent within the Kwahu Traditional Area regarding the land. It signifies a specific form of anthropomorphism, characterized as *character imitation* (Nikolina, 2008). In this mode of anthropomorphism, the anthropomorphized entity mirrors the traits, roles, and functions exhibited by humans. In the context of the Kwahu Traditional Area, the land embodies a form of anthropomorphized character imitation, marked by its feminine nomenclature and its

alignment with specific Akan societal traits, roles, and functions associated with women. The land serves as a symbol of maternal care, guardianship, and sustenance, resonating deeply with the societal role of a woman within Akan culture. The process of imbuing land with anthropomorphic significance holds considerable merit as a strategic instrument for environmental conservation within the Kwahu Traditional Area. The act of anthropomorphizing the land serves a twofold purpose: it fosters ecocentrism while concurrently diminishing anthropocentrism. A research participant vividly illuminated how the anthropomorphization of land engenders a profound sense of care and protection:

> "I find it challenging to fathom why anyone would consider defiling the land. Land is akin to a mother. The same profound reverence and protective instinct I harbor for my biological mother are seamlessly extended to Mother Earth" (Afua, personal communication, November 05, 2017).

Her statement encapsulates the notion that ascribing human-like attributes to land imparts a heightened sense of recognition and empathy among community members. This is predicated on the symbolic role culturally attributed to the land, thereby reinforcing its significance, and rendering it deserving of preservation efforts.

The profound connection between the land as a maternal figure and the societal roles of women in the Kwahu Traditional Area imposes a substantial responsibility upon women in the realm of environmental management and preservation. As primary caregivers to children, the elderly, and the infirm, the broader community places a reliance on women, given their pivotal roles. The labor undertaken by women in this locale predominantly revolves around the stewardship of natural resources, encompassing tasks such as water collection and storage, acquisition of fuel sources, procurement of food, and management of diverse categories of land, including swampland, forests, and agricultural terrain. This daily interaction with the land instills a heightened sense of vigilance among women in their relationships with the land and its resources. One female farmer explained:

> "It is the women who wake before sunrise to fetch water, gather firewood, and walk the farms. We feel the land's pain because we work with her daily. If we mistreat her, we suffer too" (Abena Adjeiwaa, personal communication, July 2018).

The rationale for this heightened care is rooted in the understanding that any negligence in the maintenance of the land and its resources can have profound consequences, impacting not only the lives of women but also the well-being of their families. This assertion is substantiated by data acquired during our fieldwork interviews. For example, among all the individuals interviewed, the findings consistently reveal that a higher proportion of women, in comparison to men, adhere to environmental taboos within the traditional area. Specifically, prohibitions related to farmland activities, such as the proscription of tilling the land on specified days, were observed by an impressive 95% of the women we interviewed. In stark contrast, our fieldwork data revealed that it was commonplace to observe men either embarking upon their farming activities or returning from them on these taboo days. The reasons cited for the scrupulous adherence to land taboos by women encompass a spectrum, ranging from the acknowledgment of the land's role as a maternal figure that merits periods of respite from the myriad services it offers to its dependents, to the recognition that women represent the primary beneficiaries of the land's provisions. One elderly female farmer noted:

> "When the land is tired, it must rest—just like a mother who has given too much. If we do not give her time, she will not produce. That's why we do not farm on certain days. We must respect her strength and limits" (Akosua, personal communication, October 2017).

Another woman explained succinctly, "You do not dig the land on her resting day. It's like waking a sleeping mother—she will not forgive you easily" (Esi Nyamekye, personal communication, July 2018).

4.2.2 The sacredness of land

Among the inhabitants of the Kwahu Traditional Area, the land is not merely a physical or economic asset but is imbued with deep spiritual and cultural significance. Central to their cosmology is the widely held adage, "human beings are nothing but dust or soil," which encapsulates the belief that humans originate from the earth and ultimately return to it. This perspective reflects a sacred relationship between people and the land, grounded in ancestral and spiritual authority. The earth is considered the domain of both the earth goddess and the ancestors—entities regarded as the true custodians of the land. Far from being seen as passive figures of myth, these spiritual beings are actively involved in land governance, moral regulation, and ecological balance. The land itself is viewed as a divine endowment from the Creator to the ancestors, thereby establishing a framework in which current generations act as stewards in a triadic relationship involving the living, the ancestors, and the earth deity. This cosmological outlook exerts a strong normative influence on land use and environmental conduct. It fosters a sense of collective responsibility and moral obligation toward sustainable resource management. As Falola and Amponsah (2012, p. 69) observe in their analysis of Akan environmental thought, "their earth goddess, known as Asaase Yaa, is highly revered and considered a provider, protector, owner, and mother of her people. She not only governs matters pertaining to the land, its fertility, and productivity but also assumes a pivotal role in upholding public morality." Violations of the land's sanctity—such as pollution, overexploitation, or disrespect for sacred spaces—are believed to invoke spiritual retribution and are subject to both social and metaphysical sanctions.

In this way, Kwahu cosmology does more than imbue land with symbolic value; it constitutes an environmental ethic rooted in indigenous religious thought. This belief system continues to shape contemporary attitudes and practices concerning ecological stewardship, offering valuable insights into alternative frameworks for sustainable development.

Given the sacred status of land in Kwahu cosmology, various taboos and prohibitions have been established to ensure its protection. Certain actions are considered offensive to Asaase Yaa, the earth goddess—foremost among them is tilling the land on her sacred day, Thursday,[2] which is strictly forbidden. Agricultural activities are also

2 The specific non-farming day differs from one Akan community to the other.

prohibited on other culturally significant days and in areas reserved for royal burials. A traditional priest commented, "Every grave is a door. You do not open it without asking permission. The ancestors are watching" (Kwaku Badu, personal communication, August 2018).

Therefore, the exhumation of graves without proper rituals, such as libation and offerings, is not permitted. These practices are deeply embedded in the social fabric of the community and function as indigenous mechanisms for environmental regulation. For instance, the enforced rest days from farming help prevent overuse of the land and promote ecological balance. Furthermore, the delineation of particular lands for cultivation, along with the use of specific plants as soil quality indicators, presents a pragmatic approach. The presence of certain plants signifies the need for soil regeneration, while the emergence of different plant species indicates land fertility has been restored and is ready for use. As one elder farmer from Twenedurase explained:

> "When the soil is tired, you will see certain grasses and weeds take over. That's how we know to leave the land. After some years, when different plants grow—like ɛban or kyɛre—we know the land is strong again" (Opanin Kofi Nyame, personal communication, July 2018).

This indigenous practice bears a resemblance to the scientific concept known as "shifting cultivation" (Heinimann et al., 2017; Mertz, 2009). These restrictions on land utilization are intrinsically rooted in sustainability principles. Violations of these taboos are regarded as defilements of the land, and it is believed that misfortunes, such as drought, untimely deaths, and incurable diseases, may befall the individual or the community until the requisite rituals are performed for atonement. Numerous informants emphatically reiterated this perspective during our fieldwork interviews.

As one elderly man warned:

> "When someone mocks the gods and ploughs on a Thursday, he's not just farming—he's digging trouble" (Opanin Kovi Sasu, personal communication, August 2018).

A respondent from Nkwatia recounted:

> "If you ignore these signs and plant anyway, or you break the taboos, bad things can happen—not just to you but to everyone. The land does not forget. We must perform rites to cleanse it, or else sickness and hunger will follow" (Maame Afia Yeboah, personal communication, July 2018).

Given the profound spiritual significance attributed to the land within the study area, there exists a palpable and fervent interest among the people in all matters concerning land. They perceive it as a sacred duty to safeguard the ancestral land, a responsibility that they willingly undertake, even to the extent of risking their own lives. While some within the community, including traditional leaders and certain members, regard this deep spiritual connection as an exemplary approach to land protection and management, others perceive it as an expression of extreme conservatism. For instance, the leader of the Green Ghana Corporation, an environmental activist group, characterizes the local populace's spiritual attachment to the land as an impediment to development. In his assessment, most of Ghana's land is under the ownership and jurisdiction of local chiefs and traditional authorities. These communities, deeply enmeshed in their cultural reverence for the land and driven by their profound spiritual attachment, exhibit an unyielding determination to retain it and resist any attempts to transfer ownership. Consequently, both government initiatives and development enterprises often encounter formidable obstacles in their efforts to secure land from local chiefs for various development purposes. He contends that this unyielding stance adopted by traditional communities, while preserving their cultural heritage, is at odds with contemporary conceptions of development and can be counterproductive (Eric, personal communication, August 13, 2018). Previous research conducted within indigenous communities has substantiated this claim (LaDuke, 1993; Ngulube, 2002; Noyoo, 2007). Consequently, a call for land reforms in Ghana has emerged from some quarters (Dauda, 2009; Larbi, 2006; Obeng-Odoom, 2016), as acquiring land for development has become a contentious issue. This proposed reform suggests shifting land ownership from local chiefs to the central government, thereby vesting the government with complete authority over land administration and allocation (Adam et al., 2021; Cobbinah et al., 2020). However, many of our informants strongly oppose this proposed reform, contending that it would erode the sacred and reverential essence attributed to the land, as it would be influenced by secular worldviews inherent in government policies.

4.2.3 Water bodies

During an informal discourse with the Gyaasehene, (the chief of security for the Kwahu Traditional Area), an illuminating perspective emerged concerning the sanctity ascribed to water bodies within the region. Within the Kwahu Traditional Area, these aqueous domains are venerated as the abodes of river deities, known as "nsuo abosom," evoking a sense of sanctity and reverence. Consequently, a set of guiding principles, framed as taboos, regulates the interaction with these rivers, prescribing a cautious and restricted approach. For instance, these venerable taboos prohibit activities such as farming near water bodies, the act of defecation or urination along riverbanks, and the fetching of water or fishing in specific rivers on designated days. The wisdom that underlies these taboos serves as a conduit for cultivating a mode of conduct that harmonizes the well-being of the individual, the community, and the environment. This trilateral dimension of taboo wisdom finds exemplification in the prohibition of defecating and urinating in the vicinity of water bodies. According to this particular taboo, a belief prevails that transgressors may suffer abdominal distension or swelling if they engage in such actions near water bodies. This apprehension deters individuals from violating the taboo. Beyond the fear associated with this consequence, a meticulous inquiry into the wisdom encapsulated by this prohibition reveals a profound ecological rationale. Defecating and urinating in water bodies, it is discerned, contravenes principles of sound environmental ethics, thereby introducing pollution to the water sources. This pollution poses a direct threat to the aquatic species inhabiting these rivers and, significantly, imperils the well-being of humans reliant on these sources for their sustenance and livelihoods. The implications of these taboos extend far beyond the individual, resonating with broader concerns of ecological preservation, cultural heritage, and community well-being within the Kwahu Traditional Area.

The study area reveals a distinctive topography, wherein numerous water bodies harbor shrines dedicated to river deities, both god and

goddess, along the meandering courses of the rivers. These consecrated sites become the locus of libations and prayers, offered by local inhabitants who frequent these shrines to supplicate and fulfill pledges made to the river deities. Consequently, a designated zone, spanning several kilometers from the riverbanks and its immediate vicinity, acquires the sacrosanct status, thus affirming its role as hallowed ground. Intriguingly, certain precincts surrounding specific water bodies attain sacredness without explicit, ascertainable reasons, adding complexity to this spiritual landscape. Among the significant water bodies in the study area, such as the Afram River, several locales stand as repositories of sanctity where only spiritual rituals and ceremonies find endorsement. The indigenous populace exercises utmost caution when engaging in activities like fishing, thereby invoking an impervious shield of protection for the river and its inhabitants.

An illustrative incident, occurring in 1998, serves as a compelling testament to the profound spiritual reverence accorded to these waters. A visitor, heedless of local counsel, partook of fish from the Obenmu River at Nkwatia, subsequently developing a throat ailment of inexplicable origin. Medical investigations proved futile until the afflicted individual confessed to his consumption of river-caught fish. The remedy necessitated the performance of elaborate rituals aimed at appeasing the river goddess, eventually culminating in his recovery. This locally documented account reverberates as a tangible validation of the sacred character imputed to the river. A woman from the nearby village recalled:

> "We all know not to eat from Obenmu. That river does not forgive easily" (Akosua Dufie, personal communication, August 2018).

In light of such occurrences, it becomes evident that the water taboos function as a robust defensive mechanism, diligently safeguarding these aquatic ecosystems from the harmful consequences of human activities that imperil their purity and vitality within the traditional area.

In stark contrast to the gradual erosion experienced by some traditional beliefs in Akan communities (Asante et al., 2017; Asante, 2015; Awuah-Nyamekye, 2012), the veneration of *nsuo abosom* (the river deities), remains robust and pervasive in the Kwahu traditional area. Insight garnered from our sources elucidates that, among the communities traversed by the Afram River, a strict taboo prevails, proscribing fishing activities in the river on Tuesdays. This prohibition is rooted in the prevailing belief that Afram, the goddess presiding over the river Afram, was born on a Tuesday. A fisherman explained:

> "Tuesday is for the river and her children. If you fish, you steal from her, and she will take something back from you" (Agya Mensah, personal communication, July 2018).

Consequently, this day holds a sacred status as a period of repose for the river goddess, who is envisioned to spend this day in the company of her progeny, predominantly comprising the aquatic inhabitants of the river. In a parallel manifestation of these beliefs, the Bupru River at Kwahu-Tafo stands as a domain where fishing is categorically forbidden, a directive stemming from the conviction that the piscine inhabitants are deemed the offspring of the spiritual entity residing within the river. However, the residents are accorded the liberty to draw water from the river for domestic purposes, including drinking. Table 3, presented herein, provides a comprehensive inventory of major water bodies within the Kwahu Traditional Area, along with their associated deities and the respective taboos ascribed to them. In each instance, a transgression of these taboos carries the potential for severe retribution, a point emphatically attested by the numerous accounts conveyed by our informants, narrating the

TABLE 3 Some major rivers in the study area and their associated gods/goddesses.

Name of river	Associated god/goddess	Taboos/prohibitions
Afram	Afram	No fishing on Tuesdays; No use of chemicals for fishing; No visit to the river by menstruating women
Obenmu		No fishing in the river; No visit to the river by menstruating women
Bupru	Bruku	No visit to the river with torchlight; No visit to the river by menstruating women; No fishing in the river.
Dedemu		No fishing in the river; No visit to the river by menstruating women; No farming close to the river
Oworobong		No fishing in the river; No visit to the river by menstruating women; No farming close to the river
Asubone	Asuo Yaa	No visit or fishing on Thursdays; No farming close to the river
Obosom	Obosom	Forbidden to visit the river with black pot;
Akaworonsu		No farming close to the river; No visit or fishing on Fridays
Adowa		No crossing of the river with a dead body (corpse) before 6 p.m. on Fridays; No fishing or drinking from the river
Oku	Oku Abena	No farming close to the river; No visit or fishing on Tuesdays
Mmenkyeremu		Forbidden to wash at the riverside; No stepping into the river with footwear
Pra	Obosom Pra	No farming close to the river; No visit or fishing on certain sacred days

Source: Authors' Fieldwork notes.

consequences suffered by those who violated these sacrosanct edicts. Beyond the religious narratives that underpin these water taboos, a discernible and pragmatic facet emerges. It becomes evident that these taboos have functioned as a tangible safeguard, offering protection to the imperiled aquatic species and the sanctity of water bodies that grace the traditional area. This intricate tapestry of cultural beliefs and taboos serves as a tangible defense mechanism, shielding both the ecological equilibrium and the spiritual heritage nestled within the traditional area.

4.3 The observance of sacred or taboo days (Nnabóne)

The observance of taboo days within African communities represents a complex and culturally profound tradition that has exhibited remarkable resilience across generations (Macaulay, 2020; Nwobodo, 2021). These taboos, firmly anchored in indigenous belief systems, assume a critical role in not only shaping societal conduct but also in the preservation of cultural heritage and the advancement of values promoting ecological sustainability (Adom, 2019; Chemhuru and Masaka, 2010; Ndlovu and Manjeru, 2016). The conceptualization and observance of sacred or taboo days within the traditional Kwahu community bear significant implications for the management of the natural environment. Within the cultural lexicon of the Kwahu people, the term "nnabóne" is employed to denote what anthropologists discern as "taboo days" (Fortes, 1966; Steiner, 2013). Etymologically, "nnabóne" can be deconstructed into two constituent Akan elements: "nna," signifying days, and "bóne," connoting bad or evil. Consequently, the term "nnabóne" is best translated as "bad or evil days" in a literal sense. Taboo days hold a dual significance in Kwahu culture, manifesting as both sacred periods dedicated to the veneration of gods and ancestors and as ominous occasions earning their designation as "bad or evil days." The latter characterization stems from the misfortunes and calamities that individuals may incur when transgressing the established norms and codes of behavior on these days. As one elderly man in Nkwatia recounted, "A young man once went to the farm on Akwasidae. That very day, he cut his foot badly and bled for hours. The elders said it was because he disrespected the gods."

Within the traditional Kwahu society, akin to numerous Akan communities, a set of four principal sacred days recurs at intervals of approximately 6 weeks. These sacred days, namely Akwasidae, Awukudae, Fofie, and Fódwo, are marked by a strict prohibition against venturing into the forest for any purpose, engaging in agricultural activities, or pursuing fishing endeavors. Akwasidae and Awukudae, two of these sacred days, hold a distinct significance as occasions dedicated to the solemn act of libation pouring and the presentation of offerings to deities and ancestral spirits at various shrines dispersed across the expansive terrain of the traditional Kwahu domain. As a traditional priest noted, "On Akwasidae, even if you are starving, you do not enter the forest. The land belongs to the spirits that day." In contrast, Fofie and Fódwo bear direct associations with medico-religious symbolism, emphasizing purification, and invoking the presence of anthropomorphic spirits inhabiting natural manifestations like rivers and caves. One local healer in Mpraeso explained, "Fódwo is not just about rest. We perform rituals, use herbs to cleanse ourselves, and ask for protection. It's a sacred day for healing." Beyond these four cardinal sacred days, the traditional Kwahu calendar accommodates a plethora of distinct sacred occasions, each dedicated to particular deities within discrete communities of the Kwahu Traditional Area. For example, the Brupu River goddess at Kwahu-Tafo, known as Bruku, partakes in principal rites on Memenada-Adapa, an occasion that precedes Akwasidae. A shrine attendant shared, "Bruku must be fed before Akwasidae. If we skip her day, the river floods or the fish disappear." Similarly, the cult of Tigari, a deity originating from Northern Ghana, and endowed with shrines scattered in select regions of Kwahu, observes its sacred ceremonies on the Thursday succeeding Awukudae. A cult member explained, "Tigari's Thursday is for sacrifice and silence. No one farms. The gods need peace to bless us." Various other deities are accorded reverence on diverse days within the purview of the study area. In congruence with the established protocol, the populace is strictly prohibited from venturing into the forest, participating in agricultural activities, or engaging in fishing expeditions on the designated taboo days earmarked for the veneration of these specific deities and gods. A local elder affirmed, "If you enter the forest on the wrong day, it's not just your sin. The whole village feels the gods' anger."

The observance of sacred or taboo days does not entail a complete cessation of labor; however, it entails stringent prohibitions on entry into the forest and agricultural activities. These days are venerated as the repose periods of the forest and river gods and goddesses. One of our informants explained that they do not permit people to enter the forest indiscriminately. Farming and fishing activities are strictly forbidden on these sacred days because these days hold a profound sanctity, and they mark a time when the deities find repose (Chief Linguist, personal communication, September 04, 2018). Another informant added, "It's like our gods are sleeping. We must keep quiet and stay away so they can rest."(Personal communication, September 2018). Moreover, for rivers that are proximate to cultivated land, distinct taboo days are designated in reverence to the resident river gods and goddesses. While fishing operations may be curtailed on such days, there are also stringent prohibitions against the utilization of land and resources within the vicinity of the river. People are expressly barred from visiting these rivers or engaging in any activities on their banks during taboo days. For instance, those farming in the proximity of the river Mennkyere catchment area in Nkwatia are enjoined from undertaking any farming activities on Tuesdays, under the belief that contravening this prohibition and showing disrespect to the river goddess will result in poor crop yields. A local farmer explained, "On Tuesdays, we leave the Mennkyere alone. If we disturb her, the maize will not grow—everyone knows that."

The ecological advantages attendant to the observance of taboo days are of paramount significance. An authoritative figure within the Forestry and Wildlife Commission, Ghana underscores that the practice of periodically abstaining from tilling the land or venturing into the forest in the traditional Kwahu area has proven to be an effective means of preserving the natural productivity of the land. He noted, "These sacred days give the land time to recover. You see healthier soil and more animals in places where they are respected." This practice fosters the rebalancing of soil nutrients and provides

a sanctuary for wildlife. Significantly, it has contributed to the preservation of forest enclaves within the traditional area, thereby fortifying their resilience in the face of rampant exploitation of natural forests witnessed in various parts of the nation.[3] Additionally, a multitude of rivers and aquatic ecosystems have benefited from taboos that restrict human activities at designated river sites. As one fisherman shared, "When we leave the rivers alone, the fish return in greater numbers. Our fathers were wise—they knew nature needs a break." These assertions are not mere conjecture; they are corroborated by empirical findings and comprehensive studies conducted in Ghana and across indigenous communities in Africa (Awuah-Nyamekye, 2014a, 2014b; Kanene, 2016; Lssozi, 2012). As such, the institution and observance of "nnabóne" can be regarded as yielding scientific dividends. Thus, the institution and observance of *nnabóne* can be regarded as yielding scientific dividends, while also drawing attention to deeper questions of legitimacy. The findings reveal tensions in how knowledge is validated and framed. Chiefs and traditional leaders often anchor ecological practices in sacred and ancestral mandates, whereas EPA officials and NGOs interpret them through the lens of sustainability and biodiversity protection. These overlapping but unequal claims illustrate the 'politics of knowledge' (Agrawal, 1995; Nadasdy, 1999), where the authority to define conservation rests not only on ecological outcomes but also on social legitimacy. Recognizing these dynamics is critical, as the reproduction of asymmetries can marginalize certain knowledge holders, particularly women and younger generations, even while valorizing Indigenous knowledge in global forums. A discernible connection emerges between the rationality underlying taboo days and a broader scientific ethos that integrates human ethics to foster harmonious relations between humanity and the natural world.

4.4 Perspectives of conservation professionals

Interviews with foresters and officials from the Environmental Protection Agency (EPA) revealed a complex ambivalence about the role of Indigenous knowledge in formal conservation. While several acknowledged that taboos on farming near rivers or hunting totemic animals achieve ecological outcomes comparable to scientific conservation measures, others raised concerns about their long-term compatibility with state policies. As one EPA official explained: "These practices are effective, but difficult to standardize in policy. They depend on belief, and not everyone shares the same belief. If belief weakens, the protection weakens too" (Personal Communication, August 2018). A second EPA officer echoed this concern, emphasizing the challenge of enforcement in plural systems of authority: "Our laws are written for everyone, but these taboos are for those who believe. What happens when a farmer does not believe in the taboo? Can we prosecute him under state law? No. That is the difficulty" (Personal Communication, August 2018).

Foresters also acknowledged the ecological significance of Indigenous practices but expressed doubts about their durability in the face of social change. One forester remarked: "Sacred groves are some of the last intact forests we have. If you compare them to off-reserve areas, the difference in biodiversity is striking. But if the community elders lose their authority, those same groves can be cleared overnight" (Personal Communication, July 2018). Another pointed out the generational gap in adherence: "The youth see these practices as old-fashioned. Some follow, others do not. It means the future of these conservation practices is uncertain" (Personal Communication, July 2018). At the same time, some officials recognized complementarities. An EPA respondent reflected: "In some cases, what the ancestors taught and what the scientists are saying today are not different. Taboos about rivers, hunting, or farming during certain seasons achieve the same outcome as buffer zones or closed seasons in modern policy" (Personal Communication, August 2018). These observations highlight both convergence and tension, revealing how Indigenous and scientific frameworks can reinforce one another in principle, but diverge in practice due to questions of legitimacy, authority, and enforcement.

Taken together, these reflections underscore the dilemmas of integration. Rather than assuming seamless incorporation of Indigenous knowledge into formal frameworks, the findings suggest the need to acknowledge the frictions and negotiations that shape conservation practice in Kwahu. As Agrawal (1995) and Nadasdy (1999) argue, the "politics of knowledge" lies not only in whose ecological claims are seen as effective but also in whose authority is recognized as legitimate. In this case, while Indigenous practices often achieve conservation outcomes, the unequal power relations between traditional leaders, state officials, and international NGOs shape whether those practices are upheld, adapted, or sidelined. The interviews thus illustrate how conservation is not only about ecology but also about struggles over meaning, authority, and legitimacy in a rapidly changing social landscape.

5 Conclusion

This case study of the Kwahu Traditional Area in Ghana offers a compelling perspective on the enduring relevance of Indigenous environmental conservation strategies in today's era of global ecological crisis. The Kwahu people's belief in totemic animals (*ntonmoa*), reverence for land (*Asaase Yaa*) and water bodies (*nsuo*), and observance of sacred or taboo days (*nnabóne*) exemplify a deeply rooted cultural system that harmonizes human life with the natural world. These practices do not only serve symbolic or spiritual functions; they have demonstrable ecological value, supporting biodiversity protection, ecosystem restoration, and sustainable resource use.

In a world facing accelerating deforestation, climate instability, and biodiversity loss, the Kwahu conservation paradigm highlights the resilience and applicability of traditional ecological knowledge. As observed in global literature (Berkes, 2017; Gadgil et al., 1993), Indigenous Knowledge Systems (IKS) offer rich, place-based insights developed over centuries of environmental stewardship. Yet, a critical question remains: how can such deeply situated knowledge be scaled

3 During a private discussion with a representative from the Ministry of Lands and Forestry, it was emphatically conveyed that Ghana's forests are confronting an alarming state of overexploitation. Illicit logging has proliferated, and a marked disregard for the established protocols and regulatory frameworks governing timber extraction practices is distressingly prevalent.

or adapted to inform national, regional, and even global conservation strategies?

Rather than attempting to replicate Kwahu practices wholesale, it is the underlying principles—such as community-based governance, reverence for ecological balance, and intergenerational ethics—that hold promise for broader application. These values are increasingly integrated into hybrid governance models. In Ghana, for example, some sacred groves managed by traditional authorities have received recognition under state policy frameworks (Ghana Forest and Wildlife Policy, 2012), facilitating cooperation between Indigenous custodians and formal conservation bodies. Such partnerships demonstrate the value of intermediate-scale integration.

At the global level, institutions such as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) explicitly advocate for the inclusion of Indigenous and Local Knowledge (ILK) in ecological assessments and policy-making (Watson et al., 2019). Concrete examples of successful integration include the Watershed Management Projects in Northern Australia, where Aboriginal ecological knowledge has been paired with hydrological models to manage flood risks and water quality (Jackson et al., 2014). Similarly, in the Amazon, the RADAM Project and the Indigenous Park of Xingu in Brazil have shown how remote sensing technology and Indigenous land-use systems can collaborate to maintain forest cover and monitor biodiversity (Zimmerer, 2015). In Ghana, Adom (2018b) developed a traditional biodiversity conservation strategy to fill the gap or absence of indigenous ecological knowledge in Ghana's National Biodiversity Conservation Strategy to complement the existing scientific conservation models. The work has received much reception and is now used for the management of biodiversity within protected areas in the country.

These examples underscore a critical insight: the most effective conservation outcomes often emerge not from replacing traditional knowledge with science, but from weaving the two together in ways that respect the integrity and agency of Indigenous communities. The Kwahu case, in this sense, contributes a valuable ethical and epistemological framework that can enrich and diversify global conservation paradigms. As Tsing (2005) argues, Indigenous knowledge is not merely a local resource waiting to be "discovered," but part of a global political economy in which its value is constantly being redefined. In this regard, the Kwahu case study shows that Indigenous ecological knowledge is not static but dynamically reconstituted through its entanglement with global conservation discourses. Much like the "tribal elders" described by Tsing, Kwahu custodians gain visibility and authority by positioning themselves within the categories and imaginaries of NGOs and state agencies. Recognition of sacred groves under Ghana's Forest and Wildlife Policy, for instance, grants them legitimacy while simultaneously reframing their practices through the idioms of biodiversity and heritage conservation. This strategic inhabiting of global categories complicates any attempt to treat Kwahu ecological knowledge as wholly "traditional"; rather, it emerges relationally, through negotiation, adaptation, and the reworking of external development fantasies into locally meaningful forms.

In conclusion, revisiting and revitalizing Indigenous practices like those of the Kwahu offers both inspiration and practical strategies for environmental problem-solving across scales. As climate change and ecological degradation demand more adaptive and inclusive approaches, the integration of IK and science presents not only a pathway for ecological resilience, but also a step toward epistemic justice. The lessons from Kwahu reverberate beyond their local context—serving as a model of sustainable coexistence that can inform regional policies, national frameworks, and global conservation efforts alike.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by General Research Ethics Board, Queen's University, Kingston, Ontario, Canada. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

DAs: Conceptualization, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. DAd: Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. AA: Data curation, Formal analysis, Software, Writing – review & editing. VG: Data curation, Writing – review & editing.

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