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Should indigenous knowledge in development be redefined? Lessons from the artisanal mining sector in Ghana

Indigenous knowledge is often posed as a unified body of knowledge, undefiled and somewhat sanctimonious. When it does not appear so, it is claimed that indigenous knowledge, particularly, has been 'adulterated' by Westernised ideologies from colonialism and modernisation. This perceived dichotomy, i.e. indigenous versus modern knowledge, often ignores the possibility of hybridised knowledge, a continuous and complicated everyday process whereby various forms of knowledge blend in space and time. This paper, therefore, argues that the existence of dichotomous and distinct forms of knowledge is a mirage. Rather, what may be termed indigenous is a co-produced knowledge by multiple actors and agents, having evolved through rigorous negotiations, legitimisation and politico-economic contestations. We make this point by analysing the bricolage processes of alteration and aggregation between ideologies perceived to be rooted in African indigenous knowledge systems, and modern, colonially rooted religious ideologies in a Ghanaian mining village. The paper highlights the importance of context in these discussions. We conclude that particularly in rapidly shifting socio-economic, political and cultural landscapes, indigenous knowledge as a distinct body of applicable knowledge remains contestable and complex and therefore solicits for intentional dissection and detangling, especially within development practice.

Keywords: indigenous knowledge, Ghana, modernity, artisanal and small-scale mining, rivers

Introduction

Indigenous knowledge is 'indispensable' to resource protection, 'markers of distinction to the outside world' considering that they are 'time-tested, resilient and proactive' knowledge, yet it is 'often overlooked' and under-acknowledged in resource governance (Adom et al., 2016; Aniah et al., 2014; Chinouriri, 2018; Wilson, 2014; Zerner, 1999). These are typical claims that are assigned to the nature and definition of indigenous knowledge. These claims have circumscribed the nature and efficacy of indigenous knowledge, promoting the existence of a distinct, undefiled and unified body of knowledge (Agrawal, 1995). This article critiques these claims by drawing on ethnographic research conducted in a booming mining village in Ghana. The empir-

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ical evidence presented in this paper demonstrates how practices, rituals and ideologies perceived to be rooted in African indigenous knowledge systems are deployed, reinterpreted and appropriated together with modern capitalist perspectives and other non-indigenous religious ideologies.

Proponents of archetypal indigenous knowledge stress how contemporary development processes and colonial knowledge have been destructive to nature and the authentic life of rural and indigenous people (Biri, 2018). Post-development scholars, for instance, draw attention to the failure of colonial, technological and technical knowledge in protecting local resources through the conscious erosion of indigenous knowledge systems and the subjection of nature for capitalistic gains (Bryant, 1998; Cammack et al., 1993; Cowen & Shenton, 1996; Sillitoe, 1998). Opposed to the colonial idea that indigenous knowledge is irrational, parochial, backward and an obstacle to development (Murdoch & Clark, 1994), there has been a recent call to revitalise indigenous forms of knowledge as the solution to secure, protect and conserve natural environments (Ziai, 2007). These narratives have surfaced more recently amid the global environmental crisis and climatic change, based on the argument that indigenous knowledge and practices are 'unproblematic' and more intimately attuned to the needs of the natural world (Coates, 2003; Meiser, 2017; Sillitoe, 1998).

On the other hand, colonially rooted forms of knowledge with their failing principles of discontinuity, domination and determinism have created an extractive economy under the guise of development (Pálsson, 2006). Yet, this heralding of certain forms of indigenous knowledge and its associated practices as 'pristine and distinct' is problematic. Agrawal (1995) and Sillitoe (2016) have argued that these positions on indigenous knowledge situate them as existing and being practised in solitude, i.e. it is either or nothing and multiple forms of knowledge cannot co-exist. In this paper, 'we can be indigenous and modern' is a contribution to this argument, by highlighting that more often, individuals and groups are intentionally employing hybridised and blended knowledge which is carefully done through various bricolaging processes to meet multiple and competing ends and means.

The paper draws on Ghana's artisanal mining scene to justify this argument. The deleterious impact of alluvial small-scale gold mining on the quality and health of river bodies across Ghana is described as a menace. Since 2010, there has been a flood of evidence, journal articles, policy briefs and various communiques showcasing the impact of artisanal gold mining on river natural ecology and the health of mining and downstream communities. To date, the Ghanaian government has responded to these ecological threats by issuing various forms of moratoriums to pause small-scale mining activities, mainly for rivers to regenerate (Afriyie et al., 2016; Ayelazuno & Mawuko-Yevugah, 2019; Hilson & Maconachie, 2020; Ofori et al., 2021). The strictest forms of control included deploying army and marine personnel to arrest miners caught engaging in illegal mining during and after the moratoriums. Key donor

agencies have argued for a formalisation approach, which would see these informal miners brought under the control and regulation of the state (e.g. de Soto, 2000). These technocentric approaches have been a failure, despite ongoing international aid investments and policy experts' advice. As an alternative, there has been a recent call for the use of indigenous environmental knowledge to be used locally to shape ecological behaviour and to manage river and environmental destruction. The main premise of this position in Ghana is that indigenous knowledges such as belief in the power of supernatural river beings instil fear and respect for rivers, subsequently creating a harmonious nature-society relationship (Awuah-Nyamekye et al., 2014; Diawuo & Issifu, 2018).

Following these arguments, the key empirical question for this paper is, if African indigenous knowledge is pristine and potent as claimed, what direct influence does its evocation have on the physical health of rivers in small-scale gold mining sites? We answer this question by exploring the indigenous beliefs and practices of miners and individuals in Adukrom, a small-scale gold mining village. Unlike past research that has explored the ontology of this knowledge (Sarpong, 2017), this article evaluates how these beliefs shape the reification, and utility of these 'unproblematic' knowledges as they are consciously bricolaged with colonially rooted forms of knowledge.

The paper is structured as follows: the next section debates the divide between indigenous and colonially rooted forms of knowledge. Following this, we reflect on how the research question was approached through an anthropological data collection method, discussing our positionalities, shifting perspectives, the context and the approach. Using detailed ethnographic descriptions, the empirical section describes the bricolaging processes involved in aggregating and altering modern and indigenous practices and knowledge in gold mining and water pollution. The paper concludes by calling for more empirical interrogation on how indigenous knowledges are behaving and interacting in complex and dynamic socio-environments and their impact on ecological resources.

Problematising the divide between indigenous and colonial knowledges

Surface water resources play a vital role in various productive activities, rendering them a focal point of contestation, struggle and discursive rhetoric for different actors (Chowdhury & Lahiri-Dutt, 2018; Perreault, 2005; Zwarteveen & Boelens, 2014). This challenge is compounded by the competing contextual and inter-scalar ideologies, meanings and perspectives that shape everyday use, management and decision-making processes. More importantly, varying and diverging ontological understanding of water and its relations remains at the epicentre of global debates

on whether for instance water should be a public, economic or social good and who should be responsible for governing water (Blaser, 2013; West, 2016; Yates et al., 2017). Dominant ideologies embedded in global water management frameworks such as the integrated water resources management (IWRM) and the Sustainable Development Goal 6 persistently guides water governance across scales (Ofori and Mdee, 2021; Mdee et al, 2024).

Nevertheless, there has recently been a significant increase in the prominence of cultural themes in water governance (Agrawal, 1995; Colding et al., 2003). Primarily based on the assertion that modernist ideologies and frameworks on water, like IWRM, largely ignore water's plurality, subsequently encouraging water resources degradation and unequal access to water and merely regard water as a 'commodity' to satisfy human needs and for its economic value (Bakker, 2009; Linton, 2010). This cultural emphasis has meant revisiting and incorporating into mainstream water governance how some human societies (particularly indigenous communities), worship and collaboratively co-exist with water. Within the academic community, this entails envisioning water's ontology as simultaneously natural and social (i.e. 'socio-nature') and understanding how different worldviews shape how societies know and manage water. These worldviews encompass sets of beliefs that include statements and assumptions regarding what exists and what does not, what objects or experiences are good or bad, and what objectives, behaviours, and relationships are desirable or undesirable (Koltko-Rivera, 2004, 4). This 'new' discourse has reinvigorated discussions on the centrality of power, agencies, politics and livelihoods in water's complicated relationship with other resources and society (Bakker, 2012; Foran, 2015; Hoque et al., 2017; Swyngedouw, 1999; Williams et al., 2019), exploring how water is highly contested and imbibed with power and authority as it flows through bodies (human and non-humans), across and beyond extractive scales (Bakker, 2012; Budds, 2016) and the use of water ideologies and knowledge in reinterpreting water values and flows (Boelens et al., 2023; Venot et al., 2021).

The presence of ontological conflicts, i.e. conflicts involving different assumptions about what exists (Blaser, 2013) among customary, indigenous and traditional communities, necessitates the need to revisit the ongoing argument on the holistic and sanctimoniousness of customary knowledge in water resource governance and management. For instance, rooted in traditional African ideologies, surface water bodies in Ghana are associated with various worldviews. Early and recent accounts highlight water bodies as the resting bode for deities and gods, associated with particular tribes and, therefore, a symbol of customary power and authority (Davidson, 1977; Greene, 2002; Rattray, 1923). The sea or ocean deities ('mami wata') are prominent figures in everyday social and economic life in coastal towns. They are believed to facilitate, bless and abrogate trade and development in individual lives or even in a country (Braun, 2015). Sacred days for the deities are reserved for ceremonial activities and/or

to allow river gods and their children to rest, retreat from the physical world or 'bask in the sun' (Ofori-Boateng, 1977; Sarfo-Mensah & Oduro, 2007). Taboos (informal water policies mostly based on myths) and memos received from the water gods through their earthly messengers play a role in regulating water use, allocation, and access (Greene, 2002; Osei-Tutu, 2017). Immediate or future punishment is also associated with breaking these taboos. This may include banishment from the local area and generational curse which may be cured through pacification and public disgrace (Awuah-Nyamekye et al., 2014; Botchway, 1995). Such worldviews are deemed to be different from Western knowledge, grounded in indigenous communities and how they understand, explain and act on water. Accordingly, they offer an alternative practical skills and empirical knowledge, grounded in a cultural identity and everyday experiences of reality (McGregor, 2014).

It is not the paper's motive to undermine the importance of these forms of knowledge in water development or governance, as this promotes defiant localism and undervalues place-centred knowledge (Sillitoe, 2016). Whereas culturally ingrained worldviews strongly held and practised by indigenous, rural or traditional 'communities' are idealised as definite in local environmental sustainability by providing a 'rule of thumb' in resource management, their complexities can hardly be ignored (e.g. Adom & Boamah, 2020; Gautam, 2014; McGregor, 2014). Our concern is not with the veracity of this statement but rather with the term 'community'. Community is a contestable analytical concept, yet repeatedly and loosely used to think of local sites as a collection of people located at discrete and stable sites, closely interacting based on kinship, mental connection, social connectivity and local proximity (Liepins, 2000; Woods, 2010). However, like the indigenous knowledge practised by these 'communities', they are neither fixed nor stable. Thus strongly linking indigenous knowledge to these so-called 'communities' strips these complex sites of their polyvalent identities, ideologies, lifestyles, fluid territorialities, varying performances, politics and practices, and more importantly ignores the uneven distribution of such knowledge within a 'community' and even how the idea of 'being a community' is performed (Mdee & Harrison, 2019; Ofori et al., 2021a; Watts, 2003; Woods, 2010).

Additionally, culture and 'traditions' are continually reinterpreted, reimagined, rearticulated and usually draw upon modernised and westernised knowledge to provide institutional legitimacy and institutional cooperation (Meiser, 2017). Particularly when used within the context of 'traditionality' (i.e. traditional knowledge), we assume that they are fixed, homogenous and immortal (Latta, 2022; Meiser, 2017). These forms of knowledges are continuously undergoing experimentation. As Agrawal (1995) points out, what is defined today as indigenous knowledge may in fact be formed through the transmission, exchange, learning and adaptation of knowledge between different cultures (e.g. between cultures in the Asia and Americas in the fifteenth centuries). These processes of reinterpretation, negotiation and legiti-

mising constitute the core empirical analysis of this paper. This process of bricolaging involves people consciously and unconsciously draw on existing social and cultural arrangements, knowledges and practices to be repurposed to shape institutions in response to changing situations (Beresford and Wand, 2020; Cleaver, 2001). It investigates the various forms in which this bricolage takes place, and how power works through 'communities' and individuals identified to be 'holders' of this knowledge to appropriate, reinterpret, refashion and subvert water and mining resources for their own needs and interests.

Methodology

Adukrom in context: geographical, geological and hydrological characteristics

Adukrom is a village with a population of less than 2,000 inhabitants, located within the Eastern region of Ghana (Figure 1). Its alluvial rivers (the Birim and Subri Rivers) are highly rich in gold deposits, rendering the village an active gold-mining hotspot (Nyame & Grant, 2012). The rock system located in the village contains gold-containing sediments found to be associated with the Birim River (Gordon & Ansa-Asare, 2012; Hilson, 2001). These gold-containing deposits are constantly weathered, transported, and redeposited through rivers and streams because of their loose, unconsolidated nature, forming gold deposits that are easily accessible to small-scale miners who are known to rely on simple technologies to access gold (Baah-Ennumh, 2012). Emigration of artisanal miners seeking new mining frontiers following a series of strict government crackdowns and policies against illegal artisanal mining between 2006 and 2012 played an influential role in Adukrom's mining boom (Hilson et al., 2007). For instance, a significant number of migrant miners relocated to Adukrom and its surroundings from the Ashanti Region after facing eviction from government/corporate policies that rendered mining lands strictly available for large-scale mining operations (field interviews, 2019). These geomorphological characteristics, combined with other socio-economic and political occurrences, have rendered artisanal gold mining a complementary activity to the longstanding crop farming in the village (fieldwork data, 2019; Hill, 1963; Ofosu-Mensah, 2016).

Extraction and processing of gold occur inside and along all the river bodies located in the village. Each of these rivers has various spiritual symbolism, indigenous values and knowledge attached to them. We turn to some of these narratives briefly in the empirical sections below. The Birim River, to date, is considered an invaluable cultural property of the Akyem Traditional State. Its headwater is found within the Atewa Range, one of the biodiversity hotspots in Ghana. 'She' emerges from the Atewa mountain together with her 'brothers', the Densu and Ayensu rivers,

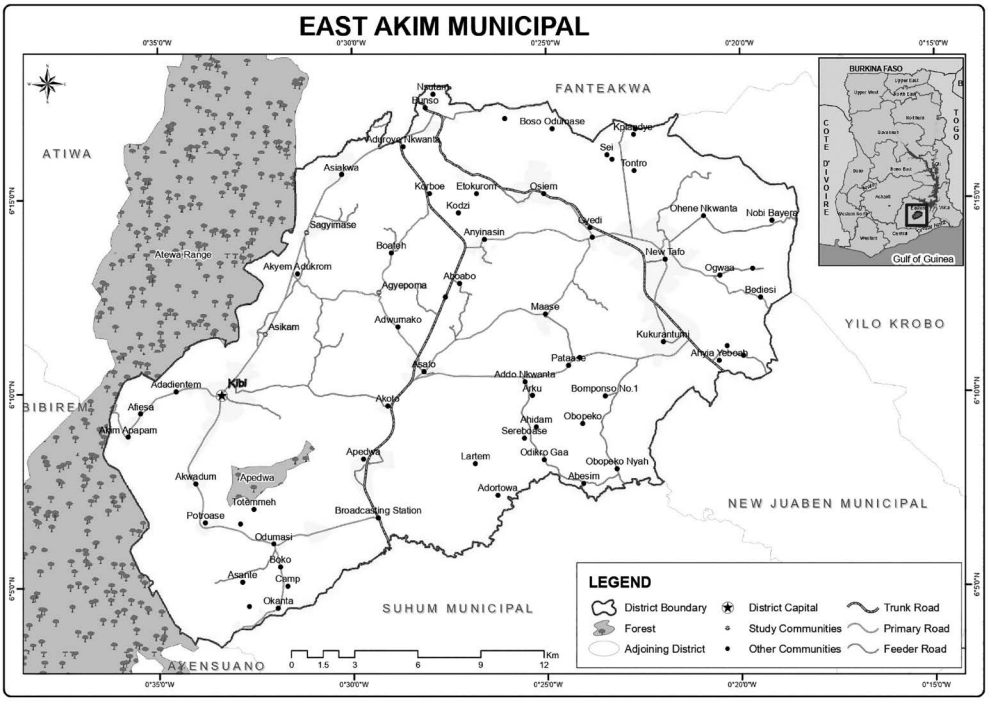

Figure 1 Location of Adukrom within the East Akyem Municipality (now renamed as Abuakwa South Municipal Assembly) in the Eastern Region of Ghana

before diverging away from each other (Gilbert, 1989). Birim heads towards the Kyebi township, through Adukrom and has total drainage of about 3,875 km² (Gordon and Ansa-Asare, 2012). The Subri River, on the other hand, emerges and flows from the north-western part of the village and confluences with the Birim on the Eastern flank.

Research approach: ethnography

The aim of this paper is to produce an ethnography of a specific context, i.e. 'rural' and 'indigenous' sites in Ghana, to showcase the bricolaging process (negotiations, legitimisation, compromises and politico-economic contestations) that co-produces indigenous African knowledges on natural resources. Ethnography – as a research approach and method where the researcher assumes an open-ended perspective; participating covertly or overtly; watching, listening, observing and documenting events of interest in circumstances where reality and causal mechanisms intersect for an extended period – best suited the research objective (Brewer, 2000; Hammersley & Atkinson, 2003; Harrison, 2018).

The lead author lived and conducted participant observations, focus group discussions and interviews in Adukrom from February to December 2019. This involved active participation in everyday cultural, economic and political life in the village, visiting mining sites, interacting with miners, community residents and leaders on a daily basis, and recording these observations in a field diary. Twenty-five formal interviews were conducted with village residents, five focus group discussions and three artisanal mining site visits. Participants were informed of the confidentiality of their contributions and were assured of anonymity. All names used in this paper are pseudonymised. Interviews and focus group discussions were recorded, transcribed and organised using NVivo v.12. This was complemented by field diary notes (based on reflection and informal conversations) and grey literature. The analytical themes in the study were identified through a manual process of reiterative reading and categorisation of the data texts. This approach allowed for a deeper understanding of the ethnographic data and facilitated the identification of common themes and patterns within the dataset.

What does it mean to be both modern and indigenous?

Indigenous attachments to Adukrom Sacred Rivers

There are various narrations that attempt to link the myriad indigenous knowledge, practices and rituals of the Adukrom rivers to historical origins. This section, therefore, discusses these accounts to set up the foundation for how these narratives are bricolaged within a mining and extractive context.

Birim is believed to be the only goddess of the three siblings who emerged from a rock source in the Atewa Range in the Akyem Highlands after being sent to Earth by their blind father (Ephirim-Donkor, 2016a). The three deities/siblings are Yaw Densu (a Thursday god), the middle sister Birim Abena (Tuesday goddess) and the last-born Kwabena Ayensu (Tuesday god). Birim Abena is perceived as a beautiful woman covered in diamonds (Ephirim-Donkor, 2016b). The people of Akyem Traditional Area believe that their ancestors emerged out of the Birim. Accounts tell of the first chief of Akyem Tafo (the indigenous tribe of Akyem), Nana Okuru Banin I and his clansmen mythically appearing out from the Birim River holding a burning log of firewood and his clan stool in another hand (Osei, 2008). He was accompanied by a high priest, Okomfo Asare, who possessed a Shrine (the Ohum Shrine). However, they had to dive back into the Birim River to hide from a hunter. Every member of the entourage successfully came out from the river, except for Bawaafri, the queen mother. This event happened on the Tuesday after an Akwasidae (a sacred Sunday). Apart from Tuesday being the day of birth for Birim Abena, some believe the day is sacred as a way to honour Bawaafri (Botwe-Asamoah, 2009). Before the death of

Nana Okuru Banin, it is believed that he dived back into the Birim River, returning with three palm seedlings (*mmerenkensono* (Twi)), signifying peace and prosperity for his people. These accounts allude to the Birim's key role in the historical formation of the Akyem tribe and lands, the traditional area where Adukrom is located. The indigenous people of Akyem's spiritual connection with the river deity is reflected in a popular slogan, 'Akyemkwa a ɔnom Birim', which translates as a native of Akyem undoubtedly drinks from the Birim (Ampofo, 2012, 59). The Birim River is central to the celebration of the Akyem's Ohum annual festival. The river is still believed to be the abode for Akyem ancestors (Osei, 2008). Indigenous taboos restrict activities in or near the river on Tuesdays, (especially on sacred Tuesdays, Benada Dapaa, according to the Akan traditional calendar) where rituals occur on the riverbanks.

Subri's indigenous attachment can be traced to the nineteenth century. It is believed that in the 1900s a group of young men led by Opanyin Darko travelled from Akuapem Adukrom to the Akyem traditional area in search of viable cocoa land. Upon finding the land and returning to their village in Akuapem Adukrom, an oracle revealed to Opanyin Darko, the founding father of the village, that he will be successful on the new land if he gives the right homage, respect and accordance to the river that borders Adukrom (naming his new land after his origins) and the next village, Akyem Sagyimase. The river, Subri, was inhabited by a god, Akwasi Subri, believed to be a man born on Sunday. It was this oracle that revealed the likes and dislikes of the god, which formed the foundation of the indigenous knowledge and norms of the Subri River. The river can be accessed every day. However, the god prohibited menstruating women from coming near him as menstrual blood represented filth and pollution (Agyekum, 2002). Older women narrate that this taboo was strictly enforced 'in their days' to the extent that menstruating women were advised not to look at the river. Women travelling in vehicles that were crossing the river were blindfolded when they were menstruating. It was also considered an abomination to enter the banks of Subri with any black object. These may include black pots, pans, sandals and clothes. Residents were unsure of why the colour black was considered a taboo. However, Hagan (1970) explains that black (tuntum) in Akan spirituality signifies darkness, loss and death. Footwears were also prohibited near the river, as this is considered an act of polluting Subri's body. Additionally, Akwasi Subri prohibited noise-making or public disturbance between 6 pm and 6 am to allow 'his family' to rest in the evening.

Blending and altering knowledges in Adukrom

This section highlights how the indigenous knowledges and meanings attached to the rivers and other knowledges deemed indigenous were altered and aggregated with other forms of knowledges to drive gold mining and extraction in Adukrom.

It presents snippets of field diaries on encounters with artisanal miners and their stories of how their intentional bricolaging processes to pursue individual and collective interests.

Mr Jima, an artisanal miner gave a sermon at a church the lead author attended at Adukrom. Jima is also an elder of this local church congregation. His sermon that day was about idol worshipping and how that deviates from pure Christianity principles. He spoke about the 'heathen' practices that miners engage in to extract more gold and protect their mining sites from spiritual and physical attacks and how that contradicts bible teachings like in 1 Corinthians 8. In a post-sermon discussion with him, he was asked to expand on what these practices were and whether he has been able to abstain from these practices as a Christian. He acknowledged that he believes that rivers, land and gold are dwelling places for spirits and deities (both good and evil). He comes from a royal lineage, and thus such practices are common in royal families. Besides that, he believes the world is not as 'physical' as we see. Therefore, gold mining, particularly around rivers, should begin and end with the mine operator or owner respectfully talking and seeking permission from the land, river and gold spirits and asking for their blessings and protection from evil spirits and envious eyes. However, the effectiveness of the ritual depends on the performer/ritualist, the donations to be given to the spirits (e.g. drinks, goats etc), time or duration, and modality of rituals. This, he ascertains, is part of being a miner. However, being a Christian and a Church elder meant that he could not directly be seen participating in rituals. He, therefore, makes his 'heathen' request through customary village authorities. He narrates that:

> every river has its ritual, so you must consult the river first. Birim particularly likes schnapps and sheep. Any land I get around Birim, I approach the village elders with sheep and schnapps for sacrifice. They will say to Birim, 'Jima, your son, is coming to work here, so release everything to him so that he will prosper'. I do this because I don't want any evil spirit to drive the gold away. (Interview with Mr Jima, November 2019)

This clearly demonstrates how individuals embodying hybrid knowledges navigated and applied these supposedly unrelated practices. When Mr Jima was questioned why he contradicted himself, reminding him of his sermon to his congregation earlier, he aptly quoted a bible verse from the New Testament, 'We should give to Caesar what belongs to Caesar' (Matthew 22:21). Under this confusing circumstance, he resorts to giving to Caesar (i.e. the river gods) by only providing money and drinks to village customary authorities but never there to witness. Witnessing by being present at the time of rituals is equivalent to participating in paganism, he believes.

In Jima's case, his Christian and indigenous (a member of the royal family) identity, though conflicting, was crucial to his ability to negotiate and access river and gold resources. In other circumstances, both Christian and Islamic practices were deployed by miners to communicate and fulfil their indigenous duties to spirits and deities.

This bricolaging practice was known throughout the village and among labourers at mining sites. For instance, a labourer at a mining site explained that,

> because gold sites are connected to water, you need a strong person who has a spiritual eye. If the spiritual person comes to your site, he or she can tell what the river or earth spirit wants. If you give the river what she desires, she will release the gold to you because she must hold her end of the bargain. (Labourer at a mining site, October 2019)

Hence, for Kwasi, a migrant miner, 'spiritual' fathers, usually charismatic 'men of God' or Islamic leaders (known as mallams) who provide guidance on how to petition spirits and mediums are important elements in gold mining. Personally, his 'father' is a charismatic pastor, the 'sharpest' spiritual man he knows. This 'sharp' pastor knows what Earth spirits desire and can 'see' the spiritual realms. He regularly consults him, because the pastor's guidance or 'akwankyerɛ' (showing the way) helps him in his gold mining business:

> I always follow what my spiritual father instructs. He comes to my mining site regularly… I have never killed any animal. My spiritual father mostly asks me to buy millet or rice for the river. Some rivers want bread. That's what they ask for every week. (Interview with Kwasi, October 2019)

What is fascinating about this bricolage of practices, cultures and beliefs was the effort individuals made to define a boundary around what is indigenous practice and their identified religions (e.g. Christian or Islamic). In the case of Jima, he is not defiled by these rituals because he is not a witness to it. Kwasi, on the other hand, argues that by not shedding blood and consulting a Christian man renders his actions and request for extracting gold non-indigenous, even if they are meant to communicate with the spirits. They contrast their argument to other miners who consult fetish priests. These priests more often request that miners shed some blood to create a stronger bond and justification for their exploitation as bloody sacrifices are supposedly efficient in cementing human bonds with spirits (D'avignon, 2018; Sarpong, 2017). Werthmann (2005) discusses that in Burkina Faso and other parts of Africa, discovering gold means discovering a blood-thirsty spirit's secret, which translates into dangerously interfering with earth spirits. But there were other justifications for resorting to fetish priests, who are deemed to be indigenous actors, and pouring blood for the river deities. Besides its spiritual significance and indigenous underpinnings, in Adukrom, shedding blood on mining gave site owners some form of legitimacy, safety, authority and power.

But this was contingent on the severity of the sacrifice. Goat, fowl and sheep sacrifices were a norm (as seen in the case of Jima) and did not invoke any fear or respect from peers. Sacrifices like 'burying three puppies alive at a mining site', something that Affoh (an indigene) performed on behalf of another non-indigenous miner (a

Christian), commanded authority. Affoh narrates that when other miners got to hear of this, it became known that the Christian has become 'spiritually strong' and they could not 'mess around at his site'. For Affoh, performing the act made him 'fearsome', gaining a new level of respect and authority among his colleagues. Some labourers added that they sometimes sought assurance from site managers that spiritual permissions and rituals had been performed before they could work at a site. Mine labourers believed that if these acts to the spirits of the land were neglected, river and earth spirits would demand human blood as a form of retribution. This could manifest in the form of mine shaft collapses and unexplained accidents at mining sites.

Impact of negotiating hybrid practices on water quality and gold mining

The previous section discussed the negotiations, rationales and spaces in which rituals and performances to earth and Birim and Subri river deities took place. They were occurring mainly as a result of adherence to indigenous beliefs, but also to secure legitimacy, power and territorial control over physical spaces and for spiritual protection. These were the specific avenues where miners, spiritual fathers and mallams and indigenous and non-indigenous religious actors displayed their blurred identities through a process of bricolaging religions, knowledges and practices; being both modern and indigenous. Nevertheless, whereas these practices have been primarily believed to be rooted in reverence for earth spirits and deities and should, therefore, translate to securing rivers and natural resources, this was not the case in Adukrom. This section describes the impact of these bricolaging practices on river quality and governance.

This research began in Adukrom to understand the complex nature of water pollution caused by artisanal mining in Ghana. Throughout the period of fieldwork, both rivers were heavily polluted, and neither were safe for domestic purposes. Interviews with miners suggested that the permission sought, and subsequently granted by river deities and spirits meant that they could, 'to an extent' extract whatever they want, including breaking certain taboos associated with the river and the deities. Thus, for instance, around Subri, there was little to no adherence to any of the river's indigenous rules: black containers were used in fetching riverbed and bank deposits, miners worked beyond 6 pm along the banks of Subri (apart from Thursdays), heavy and noisy machineries were operated alongside the river and footwear was always worn around the river. For the Birim River, only the no-activities on Tuesdays were adhered to. Subsequently, miners had successfully situated their claim and control over river resources through their hybridised application and navigation of indigenous rules, knowledges and practices.

Some miners alluded that their behaviour along the riverbanks was justifiable because sacrifices could always be performed to appease earth and river deities for

their deleterious actions. Customary authorities played a complicated role in this appropriation and circumvention of indigenous practices and beliefs. As seen in the case of Jima, they were often asked to perform these rituals on behalf of miners before, during and after mining. Simultaneously, they are responsible for upholding these indigenous practices, to secure and protect the rivers and natural bodies entrusted to them by their ancestors. An elder begrudgingly lamented how the matter was out of the hands of older generations in the village, considering the greed and poverty that drove these youth of the towns to disregard the rivers:

> The only thing we had in this town was agriculture. Our grandfathers didn't know much about gold mining. Knowing this, when the gold came, I never involved myself in it. The only thing I rely on is farming. There were laws on this land that our grandfathers institutionalised for us. We didn't change any of these laws. So why destroy a river left for us by our grandfathers with mining? It is the young men who destroyed the water! The surprising thing is that they all live in this community and relied on the water for other uses, yet they ignored all that and went ahead to destroy the water. (Interview with Village elder, November 2019)

It was not only elders who had issues with how their 'grandfather's laws' were being disregarded. We were informed of some cases where Subri, particularly, had become so angry that he revealed himself to warn the village's customary authorities. In early 2019, it was said that a young lady believed to be from the royal family was possessed by the Subri god. According to eyewitnesses who corroborated this story, this was because Akwasi Subri, the river deity, was dissatisfied with how the river's laws and taboos were disrespected by villagers and migrants. Others have even suspected that previous chiefs and elders of the village had died because they were summoned by ancestors and the river spirits to account for their role in destroying the village's treasure. Ntiamoah (2020), in an interview with a sub-chief of Asiakwa, a neighbouring town of Adukrom, revealed that chiefs in mining towns within the area that have allowed indigenous customs and rules to be subverted had died under mysterious circumstances. Hence in Adukrom, when Subri revealed himself through one of the villagers, the authorities realised they needed to act:

> The river revealed itself about 3 to 4 times to us; in dreams and through a lady. It warned that if we are not careful, there is going to be a plague and children are going to die. We didn't relax, we removed sediments, unclogged and weeded the river and its banks. The miners were summoned, and we (village authorities) informed them that they should be ready to bear the cost of the sacrifices since they are responsible for the chaos. They contributed money and took care of all the expenses for the rituals that needed to be done; sheep, drinks and everything. They were not hesitant at all. (Interview with village elder, October 2019)

Beyond performing rituals on behalf of some miners, provoking and therefore forcing the ancestral spirits and river gods to 'speak' also provided customary authorities some control and authority over the rivers. In these scenarios, as seen from the above, miners can be summoned to contribute financially, perform more rituals and even adhere to certain man-made rules, even if the enforcement and effectiveness of the rule is temporary, i.e. temporary in the sense that pollution and mining activities were still occurring on riverbanks after this incidence. Individuals continued negotiating with land and river spirits through their periodic rituals, sought consultation from different religious and spiritual leaders, whilst seeking strategies to legitimise and exert control and authority whenever they can, by inviting multiple knowledges, practices and actors to participate in these processes.

Thinking through bricolage knowledges for river protection

This article has challenged the perceived dichotomy existing within water knowledge regimes and governance, i.e. indigenous versus modern knowledge, by drawing attention to the hybridised knowledges at play in especially extractive spaces. Resource extractive spaces such as mining sites and communities are hotspots of intense conflicts, not just over resources, but also knowledges and values (Boelens et al., 2023; Bremner, 2013). These tensions are observable within Adukrom through the intentional and unintentional bricolage of knowledge produced through the continuous and complicated everyday processes of articulating and altering each other in space and time.

Olivier de Sardan (2013), writing on the rationalities within anthropology and development that have shaped Western conceptions of Africa, notes how African 'religious' rationalities are often situated against Western rationalities, ignoring how African peasantries react to multiple rationalities. The increasing rate of river pollution in Ghana and the largely rapid deterioration of resources globally in the so-called global South has, as stated earlier, enlivened these dichotomous discussions. As 'ecologically noble savages' (Redford, 1991), people living in rural areas are expected to be 'great' custodians of indigenous knowledges, which is 'an integral force of their everyday lives' (Adom et al., 2016). Modernist development agenda through acclaimed 'good governance' models of participation, have enlisted certified good practice of engagement with indigenous people and their knowledges. However, we observe in Adukrom how these indigenous rules are continuously altered and aggregated by miners, indigenous authority leaders, 'pastors' and mallams through reinterpreting the needs of river gods, altering both knowledges and practices that had been aggregated from multiple sources to produce new and hybridised institutions to advance their extractive agendas (Vazquez-Brust et al., 2024). This process of 'tweaking and tinkering' (De Koning and Cleaver, 2012) begins by disengaging rivers and associated earth spirits from the origin of their taboos, customs or knowledge. For instance, their

importance or role is no longer for state protection (as seen in the origins of Birim and Subri) but for economic productivity and legitimising power and authority. We also observe a shift in the role of river deities, which is combined in every possible way to achieve economic productivity and capitalism.

Indigenous knowledges in Ghana are rooted in the reverence for the rivers and their spiritual significance in historical state formation and security, protection and the economic, social and political life of communities. However, this paper has argued that indigenous knowledge systems as a standalone body of knowledge, as popularly claimed (Awuah-Nyamekye, 2009; Senanayake, 2006; Shiva, 2002), cannot safeguard natural resources, particularly in contested contexts such as Adukrom. This, again, is not to ignore the key role that indigenous movements and the new water justice movements in other contexts may have employed indigenous foundations to fight for natural resource rights and control (Boelens et al., 2023; Camacho, 2012; de Vos et al., 2006). However, in situations where indigenous knowledge is no longer 'traditional' but is constantly undergoing reinterpretation in response to socio-economic activities, modernisation and other alternative forms of knowledge, spirituality adapts a dynamic and hybrid character, with individuals selectively incorporating beliefs from multiple religious realms to legitimise their actions (Balée, 2019; Filho, 2009; Koelble & Li Puma, 2011).

Conclusion

We agree with Dei (2000) that indigenous knowledge does not sit in a pristine fashion outside of the effects of other knowledge and is resistant to ongoing social change, a change continuously fostered by globalisation and donor-prescribed development in countries like Ghana. For instance, most so-called indigenous and traditional contexts today struggle with the identity of the different forms of knowledge regimes that shape their lives daily (Filho, 2009). Importantly, this paper has clearly established that the ongoing transformation of 'traditions' or 'indigenous' knowledge regimes is not merely a victim of rapid modernisation but rather undergoing a bricolage process of adaptation and alteration, exploration, resistance and reflexivity, in combination with and against modern development (De Bruijn et al., 2007). Therefore, we conclude by posing the following future empirical and theoretical investigation.

Belief in the spiritual power of river deities is central to the cultural significance of rivers. This is reflected in the taboos, myths and norms. These norms demonstrate the agency, desire and power of the rivers, the spirits they embody and their role in socio-political and economic relations. Some scholars have argued that mining pollution can be curtailed if the cultural significance attached to rivers is replaced where modern water and resource management institutions have failed (Sarfo-Mensah and Oduro, 2007; Asiedu-Amoako, 2014; Osei, 2017). Hence, in these instances, where

development, personal interests and authority trump cultural hegemony in an ever-growing capitalistic society, what capacity, incentives, and motivations do customary authorities and communities have to oppose the logic of capitalism and enforce indigenous knowledge and practices for resource protection? Thus, to what extent can indigenous knowledge be widely and effectively applicable in natural resource development? What power do indigenous knowledge custodians have in securing natural resources and driving developmental change when they operate in such a hybridised, contested and complex socio-cultural, political and economic environment?

Secondly, considering the recent biocentrism around resource development, i.e. allocation of legal, kinship and personhood status to nature and rivers (Boelens et al., 2023; Cohen et al., 2023), should rivers (and, to a large extent, nature) be considered as partakers of their ecocide? Narrations from individuals like Kwasi, Affoh and village elders about how rivers communicate, reveal, warn and permit extractions underscore the agency of nature as non-human actors in these processes. Literature on the agency of non-human entities emphasises their cyborg characteristics (part human, part materialistic, e.g. the Birim as a woman covered in diamond) as they interact and co-shape socio-spatial configurations in the transformation of liminal landscapes (Haraway, 1991; Penely and Ross, 1991; Latour, 2005; Swyngedouw, 1999). The profound impacts of this dynamic representation of rivers as cyborg actors and their agencies, although often subliminal, on the everyday reproduction of knowledge cannot be ignored. Their symbolic and sublime agencies permitted them to exert certain political and economic power over mining, culture and discourse, which evidently resulted in the grave pollution of surface waters.

The final question that we contemplated among ourselves as authors taking a critical cultural stance, at a point where there is a call for a cultural turn in water and development studies (Boelens et al., 2023; Bonnell & Hunt, 1999; Cohen et al., 2023; Mollinga, 2019), was the question of what exactly is indigenous knowledge, particularly within the sub-Saharan African context? (Weeber, 2020). Like modernised knowledge regimes, what forms of power, authority and legitimacy are allocated to them, considering that meanings and interpretations are co-constructed in particular settings of power and contestation (Allouche et al., 2015, 216)? Looking inwardly into the context in which this research is produced, the point here is not to brush aside that these 'indigenous' knowledge systems ever existed, perhaps in their 'pristine' forms, and were instrumental in the security and sovereignty of their indigenous states and inevitably protection of natural resources. Here, we are interested in how they are utilised in contemporary and ever-dynamic contexts amid rapid development change and the new unseen rules and norms that are defining their instrumental values. We observed in Adukrom the ongoing process of struggle, domination and resistance in deciding what is relevant and what can be combined (i.e. bricolage processes). All these observations beg for further empirical search into the ignored power and

political ecology that underpin what counts as indigenous knowledge within development in contexts like Ghana and broadly sub-Saharan Africa.

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