



Beyond “Save The Earth”: Oral History and Javanese TEK of *Poleng* Cloth in the Sacred Climbing Trail of Mount Arjuno

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Abstract. Anthropogenic climate change and the degradation of mountain ecosystems necessitate more grounded conservation approaches. Unfortunately, contemporary environmental campaigns in Indonesia remain dominated by Western perspectives such as the abstract slogan “Save the Earth” which often fail to engage the consciousness of local communities and hikers. This study explores localized conservation alternatives through a Traditional Ecological Knowledge (TEK) approach, focusing on the tradition of placing *poleng* cloth (a black-and-white checkered cloth) along the Mount Arjuno climbing trail via Purwosari, East Java. This trail is renowned for its abundance of ancient Javanese spiritual sites that continue to be communally maintained. Utilizing the oral history method with in-depth interviews of *jarek* (cultural custodians), indigenous communities, and local guides, this study reveals how the spiritual significance of *poleng* cloth transforms prominent trees and forest areas into inviolable sacred spaces. This tradition embodies the philosophy of *Memayu Hayuning Bawana*, proven effective in safeguarding protected forests from exploitation and human negligence. The findings assert that oral history and local eco-spirituality serve as potent instruments for mitigating environmental degradation in the contemporary era, while simultaneously offering a decolonization of global sustainability narratives.

Keywords: Traditional Ecological Knowledge (TEK), *Poleng* Cloth, Mount Arjuno, Oral History, *Memayu Hayuning Bawana*, Forest Conservation.

1 Introduction

Environmental conservation campaigns serve as a crucial medium for bridging the information gap between environmentalists and the wider public. Moreover, environmental issues are now a global concern that must be properly addressed through collaborative efforts [1]. Unfortunately, the implementation of environmental conservation campaigns faces many challenges. One of the greatest challenges is that very few members of the public are motivated to speak out on these environmental issues [2]. Even the slogan ‘Save the Earth’ has not yet succeeded in raising public awareness of these issues; many people remain apathetic or lack adequate sources of information [3]. The public tends to display scepticism or rejection towards environmental messages due to the massive spread of disinformation on

environmental issues in the digital sphere [4]. Generally speaking, the public has not been emotionally moved because many environmental discussions are scientific in nature and based on Western science [5].

The apathy displayed by the community stems from the limitations of the global environmental conservation discourse in engaging local communities. Yet several studies [1,6,7,8,9] indicate that community-led conservation efforts are more effective in raising environmental awareness and changing community behaviour. Local-based environmental conservation approaches often involve communities in directly safeguarding ecosystems [10] by incorporating narratives of spiritual and cultural dimensions, such as sacred natural sites. Indirectly, such approaches are capable of preserving biodiversity in several conservation areas.

Before the wheels of colonialism began to turn in Java, the forest was not merely an expanse of trees. It had long been a place where the boundaries between anthropos, bios and geos became blurred [11]. It was a living space that united ecological, social and spiritual dimensions into an inseparable whole. According to Denys Lombard [12], in traditional Javanese cosmology, the forest was often depicted as a frightening, eerie and dangerous place for the general public, as it was believed to be inhabited by spirits and supernatural forces. However, it is precisely this kind of mystical-magical perspective that organically functions as an ancient protective mechanism; the forest was very rarely encroached upon due to a collective belief that damaging or disturbing the ecosystem would mean disrupting the existence of its spiritual inhabitants, which could have fatal consequences for the community's peace, health and very survival [12].

Unfortunately, the colonial government brought about a radical transformation by restructuring the relationship between people and the forest through the forced cultivation system (*cultuurstelsel*). The forced cultivation system was an agricultural and land-lease system administered by the Dutch East Indies government to exploit the agricultural produce of the colony [13,14]. As it required vast tracts of land to produce export crops, the Dutch East Indies government expanded its land holdings by clearing forests in both mountainous and lowland areas. This was emphasised by Junghuhn (1850–1854), who explained that after the colonial government took control of Java, there was an expansion of land for coffee plantations, leading to deforestation [15]. The impact of the forced cultivation system went beyond mere physical deforestation; it brought about a more profound transformation. It restructured the epistemological relationship between the people of Java and their forests. Forests, which were originally regarded as sacred and frequently used for rituals, were transformed into land for the production of export commodities—coffee, sugar cane, indigo and tobacco [14].

The colonial government's policies did not stop at the forced cultivation system; in 1870, the Agrarische Wet was enacted in response to pressure from the private sector to encourage investment in the Dutch East Indies [16]. This law actually unleashed a wave of far more profound exploitation through a destructive legal principle: the '*domein verklaring*', which states that 'All land for which ownership cannot be proven is deemed to be state property' [17,18]. This provision had a major impact on the customary forests of Java, as indigenous communities were unfamiliar with a system of written ownership certification. Consequently, almost all customary

forests and sacred areas on the mountain slopes automatically became the property of the colonial government [19].

This monopoly on land, based on written law, was subsequently institutionalised on a massive scale at the start of the 20th century through the colonial blueprint of ‘scientific’ forestry, which centred exclusively on teak plantation [20]. This policy radically restricted, and even completely abolished, the customary rights of village communities to access the forest resources they had managed for generations [20]. Ironically, this character of exclusion, strict restrictions and centralised control in the name of ‘rational development and conservation’ did not simply collapse after independence. Instead, these colonial control structures were reproduced in their entirety by the state through modern forestry institutions, such as *Perum Perhutani* during the New Order era [20]. It was here that *Perhutani* acted as the direct authority over the forests of Java during the New Order era [21]. This state hegemony created a contemporary form of control that severed local communities from their living spaces, criminalised traditional forest use, and fuelled protracted agrarian conflicts and resistance from forest farmers [20]. Consequently, Java’s forests have been completely severed from the cosmic and spiritual roots of its communities, transformed into mere economic commodities and instruments of the state’s political power.

In an effort to decolonise the function of forests in Java, there is a need to reconstruct the orientation of environmental management by reviving local knowledge systems that had previously been marginalised. Within the context of the upstream ecosystems of East Java, this manifestation of epistemic resistance can be organically observed in the practice of marking space through the *Poleng* cloth along the sacred Purwosari hiking trail on Mount Arjuno. The *Poleng* cloth, with its distinctive black-and-white checkered pattern, is not merely an anachronistic ritual representation or an aesthetic tourist commodity. Rather, it functions as an instrument of informal environmental governance that reclaims the community’s spiritual rights to the protection of springs and ancient vegetation in the upstream buffer zone. This cloth acts as a ‘visual ecological apparatus’ that draws upon local cosmology—such as the concept of *kualat*—to regulate human behaviour.

Although the significance of local knowledge in conservation is beginning to attract global attention, most previous studies remain trapped in geographical and cultural biases, with research on the *Poleng* cloth almost entirely centred on Bali within the realm of cultural tourism. There is a massive academic gap in understanding how the *Poleng* cloth functions specifically as an ecological apparatus within the evolving cultural landscape of Java. Furthermore, the collective ecological memory concerning these sacred boundaries is often ephemeral and at risk of disappearing, as it is not recorded in formal government archives. This research therefore aims to fill this gap by applying an oral history approach, through the recording of the memories of tradition keepers (*jarek*), traditional elders, and senior guides on the slopes of Mount Arjuno. Through this method, the study deconstructs the operational mechanics of Kain *Poleng* as a form of Traditional Ecological Knowledge (TEK), an indigenous ecological apparatus of the *Nusantara* expressed in visual and symbolic form while decolonizing dominant conservation narratives that frame the mountain merely as a resource to be managed.

Reviving these oral traditions and the practice of *Poleng* cloth restores this cognitive-ecological function, reinstating Mount Arjuno's status as a living, dignified entity rather than a managed resource. Community-governed reserve systems modeled on the *Hima* framework further demonstrate that TEK-based governance offers a practical, scalable alternative to rigid top-down state enforcement, backed by proven cultural legitimacy. Finally, integrating these TEK values into secondary school curricula translates this indigenous knowledge into ecological intelligence grounded in local cosmology, cultivating the next generation of community stewards.

2 Theoretical Framework

2.1 Traditional Ecological Knowledge (TEK) and Sacred Natural Sites (SNS)

Traditional Ecological Knowledge has a very broad definition. According to Fikret Berkes [22], Traditional Ecological Knowledge is the accumulation of knowledge, practices and beliefs that continue to evolve through an adaptive, intergenerational process. TEK is also interpreted as knowledge for managing and interacting with nature [23,24,25,26,27]. One aspect emphasised in TEK is that the emergence and development of the knowledge, practices and beliefs of indigenous community stem from their interaction with nature.

TEK offers a range of practical benefits that focus not only on philosophical values but also on socio-cultural values. The system proposed by TEK is highly relevant to the protection of conservation areas, as it offers new insights into biology and ecology that can be utilised in environmental assessments [20]. Long before the concepts of nature reserves and protected forests existed, traditional communities had been protecting ecologically important areas through a seemingly simple mechanism: designating them as sacred sites. It is these sites that are now recognised in conservation literature as Sacred Natural Sites (SNS), a term referring to a form of protection for a location or site that is regarded as the centre of local cultural, spiritual and socio-economic values, serving as a reminder that humans are part of nature [28,29].

However, SNS does not work on its own, it needs mechanisms of knowledge, norms, and practices to ensure a sacred site is actually protected. TEK provides these mechanisms, activating, maintaining, and passing down the value of protecting a sacred site across generations. Berkes [30] describes this TEK-SNS relationship through his knowledge-practice-belief framework: three interlocking parts. Knowledge of the local ecosystem informs conservation practices, and both are grounded in cosmological beliefs that give the whole system moral and spiritual legitimacy. Together, TEK and SNS form the foundation for biodiversity conservation efforts recognized worldwide.

2.2 Eco-Spirituality and Javanese Cosmology: The Animate Earth

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The entire framework of modern environmental conservation is built upon a rarely questioned ontological assumption: that nature is the object and humankind is the subject. This dichotomy stems from the legacy of Cartesian philosophy, which instills the idea that the earth is an inanimate object awaiting management by human consciousness [31,32]. Javanese cosmology rejects this premise and manifests as an eco-spirituality that has long served as a system of understanding transcending Cartesian ontology. Javanese eco-spirituality is reflected in a reverence for nature, as well as in the cultivation of a spiritual personality. This demonstrates that the ecological consciousness of Javanese society is not merely practical in nature but is also rooted in an ontological and religious framework [33].

The essence of Javanese environmental cosmology is encapsulated in the phrase *Memayu Hayuning Bawono*, which literally means ‘to beautify or nurture the harmony of the universe’ [34]. This philosophy emphasises the importance of maintaining balance and harmony, as well as enhancing human life in harmony with nature, in order to preserve the balance between the *jagad alit* (microcosm) and the *jagad ageng* (macrocosm) [35]. Fundamentally, according to Mulders [36], the Javanese way of thinking is a mental process that organises phenomena and experiences to make them clear. Within this framework, the Javanese pursuit of intellectual refinement and moral cultivation constantly strives for safety and well-being, which is one of the central concepts of Javanese philosophy regarding development and progress, manifested in the endeavour to restore harmonious and balanced unity [37]. Thus, *Memayu Hayuning Bawono* is not merely an ecological ethic, but a reflection of the holistic and integrative structure of Javanese thought.

The principle of *Memayu Hayuning Bawono* is far more radical; this philosophy promotes the well-being of nature and the sustainability of cosmic harmony. Humans are part of the universe, bound by the laws of nature and bearing a moral responsibility to preserve it. This relationship positions nature not merely as a material object, but as a living entity possessing spiritual dignity [38]. Essentially, this philosophy is a teaching on the balance of nature. Theoretically, this philosophy can be broken down into seven specific ecological dimensions, such as *memayu hayuning tirta* (caring for water), *memayu hayuning wono* (caring for forests), *memayu hayuning samodro* (caring for the oceans), *memayu hayuning howo* (caring for the air), *memayu hayuning budoyo* (caring for culture), and *memayu hayuning manungso* (caring for fellow human beings) [39]. Within this framework, the forests of Mount Arjuno—including those wrapped in *poleng* cloth, are not merely natural resources, but entities possessing a spiritual dimension that demands to be preserved.

Whilst *Memayu Hayuning Bawono* provides an ethical framework for the relationship between humans and nature within Javanese cosmology, Adam Bobbette, in *The Pulse of The Earth* [11], argues that the Javanese cosmological view of nature as possessing a soul and a pulse is not only culturally relevant but has also shaped modern earth sciences. Within Bobbette’s framework, Mount Arjuno is regarded as an entity possessing a will (a geosocial formation) and a guardian spirit within the

cosmic order that must be respected. Consequently, the taboo against damaging certain trees is not merely an ecological norm, but rather an obligation to respect an entity that holds a position within the cosmic order of Mount Arjuno.

The synthesis of the *Memayu Hayuning Bawono* philosophy and the concept of a “pulsing earth” yields a significant theoretical implication: nature is not merely a passive resource but a cosmic partner that reacts to how humans treat it. This principle lies at the heart of an ecological consciousness—exemplified, for instance, by the practice of wrapping trees in *poleng* cloth along the Mount Arjuno hiking trail via Purwosari. This act represents a reciprocal gesture aimed at maintaining a harmonious relationship between humanity and the natural world.

2.3 Indigenous Water Ethics and Theological Protection

Traditional knowledge systems and religious theology have, in fact, long provided moral laws to protect nature. One of the richest examples is the use of *poleng* cloth in Bali to mark trees considered sacred [40]. However, when the sacred nature of the *poleng* cloth is juxtaposed with the concepts of *hima* and *harim* from the Islamic legal tradition, the two form a universal pattern: local beliefs and religion, each with their own idioms, together create harmony by rejecting the exploitation of nature.

Poleng cloth is frequently used for religious events and traditional ceremonies by the traditional Hindu community in Bali. The black-and-white checkered pattern on the *poleng* cloth, tied to the trunk of a tree, embodies the concept of *Rwa Bhineda*, which signifies the balance between dharma (goodness) and adharma (evil) [41]. For the Hindu community in Bali, this combination of colours symbolises grandeur, respect, authority and mysticism. The tying of *poleng* cloth to objects or trees is considered holy and sacred. This reflects the philosophy of *Tri Hita Karana*, particularly the application of the *palemahan* aspect—maintaining harmony between humans and nature. *Poleng* cloth serves as a manifestation of preserving the ecosystem through social control.

Not all trees can be wrapped in *poleng* cloth; the criteria for selection are that the trees must be large and have a good capacity to retain water [41]. Ecologically speaking, plants with strong roots and dense foliage, such as the bunut tree (*Ficus virens aiton*), are particularly effective at absorbing pollutants and producing oxygen [42]. The wider the leaves, the more dust they capture and the more air pollution they absorb [43]. When a large tree is wrapped in *poleng* cloth, it instantly becomes part of a cosmic system that must be safeguarded. This cloth serves as a marker of ecological boundaries, which the Balinese people interpret as a sign to protect, respect and preserve it.

This spirituality-based mechanism for spatial restriction finds its counterpart in the Islamic tradition of environmental law. In Islamic theology, provisions regarding the protection of nature form part of Sharia, which encompasses the protection of the integrity of valleys, rivers, mountains and natural landscapes so that living creatures may sustain their lives, as reflected in the concepts of *Hima* and *Harim*. *Hima* is defined as an area specifically protected under Sharia to conserve wildlife and forests [44, 45], categorising *Hima* into six functional typologies:

1. Conservation areas where grazing is prohibited;

2. Conservation areas for forest vegetation/trees where logging is prohibited or restricted;
3. Conservation areas that restrict grazing during certain seasons;
4. Conservation areas that restrict specific livestock species and numbers;
5. Beekeeping conservation areas that prohibit grazing during the flowering season; and
6. Conservation areas managed specifically for the welfare of particular village or tribal communities.

In modern governance terms, the *Hima* functions much like a conservation area, national park, nature reserve, or wildlife sanctuary [44]. *Harim*, meanwhile, refers to zones set aside specifically to protect water sources from farming and pollution [44]. Comparing *Poleng* with *Hima* and *Harim* reveals a universal pattern in spirituality-based environmental ethics. At the local level, *Poleng* cloth works like a *Harim*: it marks sacred zones where no physical alteration or exploitation is allowed. When the community wraps this black-and-white checkered cloth around old trees and springs along the Purwosari trail, it creates a visible, protective boundary. This boundary invokes religious and cosmological beliefs—such as the fear of *kualat*—to stop hikers and locals from polluting water sources, cutting down erosion-preventing trees, or damaging vegetation near the headwaters.

At a broader level, this same practice reflects the function of *Hima* as a community-managed reserve system. *Poleng* cloth is not just a ritual decoration, it's a tool of informal environmental governance that reasserts the local community's traditional and spiritual authority over their territory. Through consensus among the *Jarek* (caretaker), traditional elders, and *Pesanggem* (forest farmers), *Poleng* cloth has successfully marked out land-use zones without relying on rigid state enforcement. This shows that both Javanese cosmology and Islamic ethno-ecology reject the exploitation of nature by turning local mystical beliefs into a form of Indigenous Water Ethics that is valid, evidence-based, and practically useful for environmental sustainability.

2.4 Review of Key Concepts

The Nature of “Sacred Fabric” in Javanese Epistemology. Studies of cultural materiality are often subject to reductionism. For example, when evaluating traditional textiles, regional textiles are frequently viewed as passive economic commodities, ethnographic artefacts, or magical-tourist decorations commercialised for cultural heritage tourism. This perspective, however, overlooks their ontological capacity to shape spatial governance and social behaviour. Within Javanese epistemology, as practised on Mount Arjuno, the *Poleng* cloth must be conceptualised through the lens of material agency (living matter). The *Poleng* cloth is not a lifeless object, but a moral subject and an entity possessing agency. Through its alternating black and white patterns, which embody the principle of *Rwa Bhineda*, it radiates an agency that transforms the spatial status of its environment. When wrapped around a hydrological anchor tree or an ancient archaeological site along the Purwosari route, the *Poleng* cloth serves as a visual ecological tool. It instantly transforms a profane space (an unprotected forest vulnerable to exploitation) into a sacred space (*harim*) protected by moral sanctions. The role of the cloth directly influences the moral

consciousness of passers-by, demanding ecological respect without the need for the physical presence of state law enforcement officers.

The “Lock-in” Effect of Cultural Taboos (*Kualat*). Psychological compliance and spatial discipline become clear when observing how mountaineers, local guides, and forest farmers (*pesanggem*) interact. This study uses the concept of the ‘Lock-in Effect’ to explain this: a state where a person’s mindset and behavior become fixed within ecological boundaries they wouldn’t dare cross. The main driver of this lock-in effect is *kualat* — a cultural norm that acts as a spiritual-social sanction embedded in local memory. Breaking rules within the *Poleng* cloth zone (littering, cutting trees, damaging megaliths, or polluting water sources) is believed to bring serious personal punishment (*kualat*) or collective disaster, such as sudden landslides or dried-up springs. This lock-in effect, driven by *kualat*, works as an internal form of governance — and it produces more compliance than formal state regulations do. Government signs listing legal penalties are often ignored as passive, bureaucratic warnings. The *Poleng* cloth, by contrast, triggers a deeper moral reckoning that more effectively prevents destructive behavior.

De-sacralization and the Colonization of Ecological Cognitive Power. Environmental damage in river catchment areas is closely tied to how colonial and post-colonial modernity stripped historical spaces of their sacred meaning. Drawing on the decolonial concept of Cognitive Power [46,47], this section examines how Western-style scientific forestry [20] and mass tourism have taken over the ecological understanding of modern communities. When Mount Arjuno is reduced to an extraction site, a tourist attraction, or just a carbon metric, epistemic violence occurs, nature becomes passive matter to be consumed. This colonization of cognitive power breaks the reciprocal moral relationship between communities and the mountain. The real-world effects are visible: vandalism, plastic pollution along hiking trails, and degraded natural springs. In this context, reviving the oral traditions and visual practice of *Poleng* cloth is an act of reclaiming knowledge and decolonizing this relationship. Wrapping sacred plants and water sources in Kain *Poleng* is not outdated superstition — it is an active effort to restore ecological understanding, returning Mount Arjuno to its status as a living, dignified, and inviolable entity.

3 Method

This study is designed as a qualitative investigation employing a critical oral history approach. The rationale for using oral history lies in its unique ability to explore and reconstruct the collective ecological memory of local communities. To provide a theoretical foundation for this approach, we draw upon Abdurrahman’s [48] formulation of the oral tradition, in which historical information is transmitted from mouth to mouth, often without a direct link to the original witness or intermediary, except through a chain of narrators connecting the past to the listener. Although the content of this oral tradition may initially appear vague or ambiguous, it is rich in ecological and cultural significance.

To obtain in-depth, historically grounded and contextually rich data, this study employed a rigorous purposeful sampling strategy. Informants were selected on the basis of their structural, spiritual and operational roles within the ecology of Mount

Arjuno. The detailed profiles of the selected research subjects are as follows: (1) **Jarek**, the traditional and spiritual guide of Mount Arjuno as the primary epistemic authority on the sacred boundaries and cosmological rules of *Poleng* cloth; (2) **Elders** who living on the mountain slopes who possess a long-term historical memory of local environmental changes, ancestral taboos, and communal water management systems; (3) **Pesanggem**, local farmer who actively interact with the forest ecosystem; and (4) **Raden Soerjo Forest Park Officials**, who provide a crucial formal institutional perspective on current state-enforced forest protection policies, spatial conservation boundaries, and the direct interfaces and ideological conflicts between state-centred law enforcement and community-driven traditional ecological systems.

To ensure a rigorous interpretation, the oral data collected were analysed through an interdisciplinary lens. Drawing on the research [37], this study adopts an ecocritical approach strongly underpinned by cultural, environmental ethical and oral literary perspectives. All audio-recorded interviews were transcribed word for word (verbatim). The resulting qualitative corpus was then analysed ethnographically using James Spradley's four-stage developmental research sequence, as successfully operationalised in similar environmental-cultural studies [37,50,51]. Finally, to validate the oral testimonies, a source triangulation technique was used. The reconstructed oral narratives were cross-checked against physical and ecological evidence from the field — including maps of protected trees, state forest boundaries, and the physical condition of the Arjuno spring.

4 Result and Discussion

4.1 Evidence of Environmental Degradation and Policy Failure Framework

To understand how data extraction became the central Investigating the structural vulnerabilities of the Purwosari climbing trail requires an epistemological shift from abstract state metrics to empirical localized data. This section contrasts the accelerating physical degradation of upper catchment zones driven by unregulated mass tourism and spatial commodification with the systemic paralysis of top-down state regulations. By critiquing mainstream technocratic doctrines, such as those embedded in orthodox international water policy frameworks, we argue that purely bureaucratic environmentalism suffers from an inherent class bias and structural blindness, leaving the actual forest floor vulnerable to exploitation.

Empirical Mapping of Upper Catchment Crisis

Mount Arjuno is a mountainous area in East Java that forms part of the Raden Soerjo Grand Forest Park nature conservation area (KPA). At 3,339 metres above sea level, Mount Arjuno is the second-highest mountain in East Java after Mount Mahameru. Administratively, Mount Arjuno is situated on the border of Batu City, Malang Regency, Jombang Regency and Pasuruan Regency, whilst astronomically it lies at coordinates 07°40'–07°53' S and 112°31.7'–112°42.52' E [52]. The mountain comprises several types of forest areas, including protected forests, research forests and production forests [53]. However, observations along the Mount Arjuno climbing

route via Tambaksari (Purwodadi) indicate that this area also includes community forests managed specifically in accordance with a Decree of the Minister of Environment and Forestry, and reinforced by local customary practices. These areas are utilised for ritual purposes and ecological conservation, with *poleng* cloth markers distributed across the route stretching from an elevation of 1,063 metres above sea level (Ontobogo Site) to 1,403 metres above sea level (Tampuono Post II).

Mount Arjuno offers a stunning transition of ecosystems, such as tropical rainforests, moss-covered mountains and savannahs. According to the findings of the survey, the dominant tree species in this area are cypress, pine and mahogany. These three tree species provide shade, enhance soil organic matter (nutrients), reduce soil erosion, sequester carbon and boost biodiversity [53].

In addition to its rich ecosystem, Mount Arjuna is also rich in historical and traditional heritage. Mount Arjuna serves as a sacred, cosmological and religious site for the people of East Java, characterised by an abundance of archaeological remains (sites and statues) and sacred landscapes (sacred springs and hermitages) which are frequently visited by pilgrims to perform rituals. This sacred area is characterised by trees wrapped in *poleng* cloth, stones wrapped in yellow cloth, as well as incense and offerings. The practice of wrapping trees—particularly those of the *Ficus* genus (banyan trees) with a diameter ranging from medium to 1.5 metres—and marking stone structures with *poleng* cloth and yellow cloth is a tangible manifestation of Traditional Ecological Knowledge (TEK). As stated by one of the Jarek (caretakers), a tree wrapped in *poleng* cloth automatically transforms the surrounding area into a sacred space. These markings act as a medium of ecological-spiritual communication. Consequently, people must not carelessly damage the trees, which ultimately safeguards the existence of important water catchments and springs, such as at *Sendang Dewi Kunti*. This demonstrates that the *poleng* cloth along the Mount Arjuno hiking trail via Purwosari serves as a medium of ecological-spiritual communication for the community.



Fig. 1. A Tree Wrapped in *Poleng* Cloth at The *Sendang Dewi Kunti* Site (Source: Personal archive).



Fig. 2. A tree Wrapped in *Poleng* Cloth at The Ontoebogo site (Source: Personal archive).

Although this trust-based TEK system (*poleng* cloth) has been in place for centuries, its sustainability is currently under threat from two factors: global economic pressures and cultural erosion. These two factors are implications of globalisation, which is eroding the significance of tradition in terms of both identity and communal solidarity [54]. When forests are reclassified as commodities (market goods), market logic takes hold and supplants the logic of local wisdom, which is steeped in sacredness. Based on interviews with representatives of the Raden Soerjo Nature Reserve, the greatest cause of forest damage after the forest fires on Mount Arjuno is damage caused by human activity. The main focus is deforestation for the production of timber logs and charcoal burning. This occurred because, at that time, the community relied heavily on timber from the forest to meet their economic needs. The damage was also significant: the trees used for timber production were large specimens that served to retain water in the soil. Meanwhile, trees of all sizes—both large and small—were used for charcoal production. This caused massive damage to the Mount Arjuno forest area, as there was no support left for the other ecosystems present there.

On the other hand, findings in the field indicate complex dynamics between formal regulations and customary practices. Official government prohibition signs (such as Law No. 18/2013 on the Prevention and Eradication of Forest Destruction) are displayed at strategic locations such as the Watukursi–Tampuono Checkpoint junction, the Ontoboego Site, and the Tampuono checkpoint. However, at some locations, such as the Watukursi Site and *Sendang Dewi Kunti*, government prohibition signs are absent, meaning that the protection of the area relies entirely on the customary norm of the *poleng* cloth and the compliance of pilgrims. A contradiction is also evident from the discovery of the remains of trees that have been felled but are still wrapped in *poleng* cloth/ yellow cloth at Tampuono checkpoint.



Fig. 3. A Tree Wrapped in *Poleng* Cloth and Prohibiting Entry Sign at the Watukursi–Tampuno junction (Source: Personal Archive).

It cannot be denied that a morally-based ecological approach does indeed have its weaknesses; Banarjee [55] reports that local community participation in ecosystem conservation is far more difficult to implement as traditions become increasingly lax and more members of the community no longer feel bound by collective interests. This is reflected in the rampant deforestation in the Mount Arjuno area (for the production of timber and slash-and-burn farming), even though the mountain is considered sacred by the Javanese people. Trees that were once revered through the use of *poleng* cloth are now threatened with felling when economic pressures or market demand outweigh adherence to tradition. This phenomenon demonstrates that, as a result of globalisation, local communities prioritise economic interests (financial motivation) over upholding the balance in the relationship between humans and nature.

The Failure of Western Technocratic Interventions

Mount Arjuno serves as the main water catchment area, meeting the water needs of the people of East Java, particularly in the city of Batu, Malang Regency and Pasuruan Regency. Unfortunately, over the past two decades, this area has frequently suffered from deforestation and land degradation, with a range of problems including illegal logging, land-use conversion and forest fires. Behind these phenomena lie exploitative practices that are rarely captured by official statistics: the felling of timber and the production of charcoal (*pengarengan*) by residents living on the slopes of Mount Arjuno, who rely on these activities as their livelihood. The damage caused is no trivial matter; time and again, the Raden Soerjo National Park Authority has carried out reforestation in the cleared areas, yet time and again the local community continues to fell trees for production purposes. This is the point where aggregate data clashes with micro-level reality, raising the question of why formal regulations have not truly been able to resolve these issues.

Since Indonesia's forestry regulations have been framed within the social forestry scheme, there has also been a common thread running through the logic of academic forestry—which is rooted in an anthropocentric paradigm and tends to be top-down in practice. This framework assumes that ecological degradation can be addressed through a centralised command structure, massive fiscal allocations for

reforestation initiatives, and state-backed physical enforcement. However, when applied to the forests of the Javanese highlands, this paradigm reveals severe structural blindness and inherent class bias. Forest communities are treated merely as illegal offenders or passive recipients of policy, rather than as historical actors with distinct economic imperatives; state-led interventions fail to address the socio-economic drivers of resource extraction.

Under academic forestry management, the management of state forests relies heavily on formal-technical doctrines and a militarised security apparatus that deploys forest rangers who essentially operate like industrial security guards or police forces tasked with enforcing state property rights through patrols and verbal intimidation [56]. However, as critically pointed out by Santoso & Purwanto [56], there is a deep chasm between the *de jure* reality on paper and the *de facto* reality on the forest floor. Although state regulations stipulate that all timber and land within conservation zones are wholly state-owned, communities on the forest periphery continue to assert their *de facto* access by extracting timber, clearing land, and engaging in the illegal charcoal production (*pengarengan*) to sustain their livelihoods.

The grim reality of this structural divide was candidly highlighted during field interviews with forestry officials at Tahura Raden Soerjo. Reflecting on the systemic failure of the state's law enforcement on the mountain slopes, one official emphasised the extreme nature of surface mining and the risk of death faced by field personnel:

"Semua pohon yang ada pasti ditebang, dan upaya mengatasinya cenderung harus berhadapan dengan taruhan nyawa." (All the trees there will inevitably be felled, and any attempts to address this tend to involve risking one's life).

(Forestry Officer, Tahura Raden Soerjo, personal communication, 2026)

These alarming accounts from the field illustrate that state law enforcement under academic forestry management suffers not only from administrative inefficiency, but also from a complete operational deadlock. When economic pressures drive local logging, law enforcement on paper escalates into life-threatening physical confrontations on steep mountainous terrain. Ultimately, this backfires because it fails to provide viable alternative livelihoods for the surrounding mountain communities. Because excessive optimism in formal planning and the deployment of security forces overlooks human and ecological complexities, local communities respond not through formal legal petitions, but through subtle forms of subversion that echo historic peasant resistance movements such as Saminism in Java or Chipko in India [56].

In concrete terms, the shortcomings of this technocratic intervention are evident from the physical damage to the vegetation that has occurred precisely around the official prohibition signs. At Tampuono Post (1,403 metres above sea level), the remains of felled large trees have been found, which local residents and pilgrims have subsequently 'saved' symbolically by wrapping them in white cloth. These felled trees, wrapped in cloth, stand as silent witnesses to the state's failure to prevent physical logging, leading the community to revert to traditional spiritual protection mechanisms to prevent further damage to the remaining stumps.

State-sponsored reforestation efforts focus solely on technical metrics such as the number of seedlings planted, without addressing structural poverty; this actually encourages deforestation. The trees that are planted will inevitably be felled once official oversight subsides. This failure demonstrates that an academic approach to

forestry, which tends to be top-down—despite having a large budget and administrative enforcement apparatus—remains ineffective when it is disconnected from the moral framework upheld by local communities and traditional ecological knowledge.

4.2 Traditional Ecological Knowledge: Poleng Cloth as a Moral Apparatus

The exoticisation of cloth in Javanese culture is often reduced to merely an aesthetic attribute or a cultural commodity. However, this section examines the operational mechanisms of the *Poleng* cloth as an agent of active agency within the socio-ecological discipline in the Mount Arjuno region. As explained within the framework of Traditional Ecological Knowledge (TEK), local knowledge does not merely focus on techniques for managing physical resources, but is deeply embedded within a system of beliefs and spiritual symbolism [30]. Drawing on the lived experiences and oral histories of the local Arjuno community, this study investigates how the motifs on this monochromatic cloth function as profound spatial boundaries. Kain *Poleng* clearly divides the mountain landscape into zones of profane interaction and untouched ecological sanctuaries. Acting as a non-physical ‘eco-police’ constantly present in the community’s collective consciousness, this cultural apparatus ensures ecological compliance through the internalisation of a cosmological fear of ‘*kualat*’ or ‘*walat*’. This mechanism of internal compliance has proven to be far more efficient and effective in ensuring compliance than costly physical surveillance or financial fines imposed by the state.

Spatial Demarcation: The Mechanics of Visual Taboo

The results of the study in the previous subchapter show that most of the monuments in Greater Malang were built to commemorate the struggle to defend independence, especially during the Dutch The First Military Aggression and II. The Hamid Rusdi Monument, the Student’s Brigade (TGP) Monument, the Pahlawan TRIP Monument, and the Juang ‘45 Monument, are all visual representations of the resistance of the people of Malang against the Dutch colonial efforts to regain control of the state. These monuments can be used as contextual learning resources in the historical material of the independence revolution. Moreover, it can especially be used as an instrumental to understand the chronology of the battle, the local actors involved, and the sacrifices of the former younger generation, such as students who are members of the Student Genie Army and the TRIP Battalion.

An analysis of oral history data and testimonies from key informants indicates that the *Poleng* cloth are not placed at random, but rather at ecological points that play a vital role in the environment’s carrying capacity. The tying of the Kain *Poleng* to vegetation and the natural landscape visually transforms the physical structure into a psychological boundary.

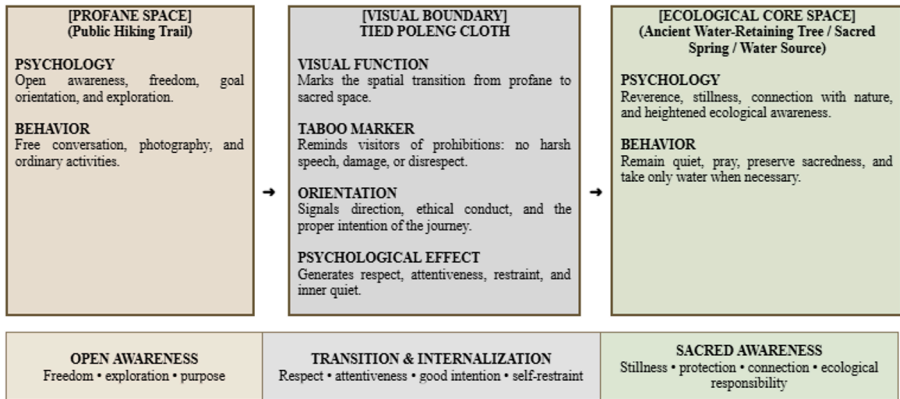


Fig. 4. Psychological Boundary of *Poleng* Cloth.

Based on Figure 4, it can be explained that:

Spatial Differentiation Between the Profane and the Sacred. The black-and-white motifs create a sharp visual contrast against the natural landscape. Tying these cloths to ancient trees (which prevent erosion and provide shade) and to areas around sacred springs changes the status of these zones. Areas outside the fabric bindings become profane spaces, used for transit and general public interaction while areas behind or around the bindings become core ecological spaces.

Visual Taboo Mechanism. As a visual marker, the *Poleng* cloth triggers awareness in mountaineers, pilgrims, and local residents, prompting them to stop potentially damaging behavior. One of the *Jarek*, Mbah Yanto, explained this cultural boundary function:

"Kain poleng sing kaiket ing wit-witan iku dudu mung hiasan. Iku penanda antarane ruang lumrah karo ruang sing kudu dihormati. Sapa wae sing weruh kain iku wis kudu faham, ora kena sembarangan ngrusak utawa ngotori lingkungan ing sakiwa tengene." (The checked cloth tied to the trees is not merely decoration. It marks the boundary between ordinary space and a space that must be respected. Anyone who sees the cloth should understand that they must not damage or pollute the surrounding environment.) (Mbah Yanto, personal communication, July 2026).

The pattern sends a clear message about the boundaries of nature's sovereignty. This creates a psychological barrier against land clearing, tree felling, illegal tapping, and water pollution.

Protection of Hydrological and Ecological Functions. Through this visual taboo mechanism, key sites like water sources (*petirtaan*) and large anchor trees are protected from human-caused degradation. Respecting these cultural markers indirectly helps sustain hydrological functions and ecosystem stability [70].

The Non-Physical Eco-Police

In practical terms, *Poleng* cloth is able to fulfil an ecological monitoring function that formal state regulations often fail to cover. Whilst formal regulations rely on physical monitoring, which is limited by the number of Tahura staff given the vast expanse of the forest area on the slopes of Mount Arjuno, *Poleng* cloth operates through the

internalisation of supernatural norms. This is, of course, deeply rooted in Javanese cosmology.

Table 1. Table Forest Ecological Monitoring Instruments on the Slopes of Mount Arjuno (Purwosari Climbing Route).

State Apparatus (Formal)	Poleng Cloth (Non-Physical Eco-Police)
Written regulations	Cosmological Consensus/tradition
Physical patrols & fines	Internal Monitoring
Limited by space & time	Constantly present in cognition
External/reactive compliance	Internal compliance (Fear of divine retribution)

The Mechanism of *Kualat* as a Supernatural Enforcer of the Law. In the cosmology of the Arjuno community, transgressing the boundaries marked by the *Kain Poleng* is not only regarded as a breach of social ethics, but also invites supernatural sanctions in the form of *kualat* or *walat*. Fear of these metaphysical consequences creates a very powerful self-disciplining mechanism. Mbah Yanto explains this supernatural deterrent effect quite plainly:

“Nek pelanggaran aturan Tahura mungking mung kena denda utawa ditegur petugas. Tapi nek wis wani nglanggar wates sing diiket kain poleng, iku urusane karo sing mbaureksa. Wong iso kualat, kesurupan, utawa nemu apes ing gunung. Dadi wong luwih wedi kualat tinimbang denda duit.” (If you break the rules of the Tahura, you might just get a fine or a warning from the rangers. But if you dare to cross the boundary marked by the striped cloth, that’s a matter for the spirits. You might incur their wrath, be possessed, or meet with misfortune on the mountain. So people are more afraid of incurring the spirits’ wrath than of a fine.)
(Mbah Yanto, personal communication, July 2026).

The psychological impact of these supernatural sanctions is directly corroborated by the experiences and perceptions of local residents who go about their daily lives in the vicinity of the forest:

“Aturan denda teko petugas iku kadang iso diakali nek pas ora ana penjaga. Tapi lek kualat ora ana sing wani main-main. Akeh cerita wong njobo sing nekat dolanan kain kotak-kotak terus ngelus-ngelus reco Semar. Akhire ora suwi mati mendadak” (The rules regarding fines imposed by officials can sometimes be circumvented when there are no guards around. But if you cross the line, no one dares to mess about. There are many stories of outsiders who recklessly played with the chequered cloth and then stroked the Semar statue. In the end, they died suddenly not long after).
(Local resident, personal communication, July 2026)

Integration of Foucault’s Theoretical Framework (the Cultural Panopticon). As discussed in relation to Michel Foucault’s theory of power relations, power and discipline do not always operate through repressive means or the physical presence of state authority, but rather through capillary mechanisms that permeate individual cognition. Foucault [57] argues that a state of organised and conscious visibility ensures that power functions automatically, so that the exercise of power no longer requires the constant physical presence of supervisors. In the context of Mount Arjuno, the *Poleng* cloth transforms the concept of the Panopticon into a cultural order. The ‘gaze’ is embodied not by prison towers or ranger patrols, but by an

awareness of the presence of a supernatural gaze (*sing mbaureksa*). The threat of divine retribution fosters self-discipline, whereby climbers and local residents are transformed into docile bodies, disciplining themselves not to damage the environment even whilst in remote areas without human supervision [57].

Table 2. The Significance of *Poleng* Cloth in the Context of Foucault’s Concept of the Cultural Panopticon.

Panopticon Variable (Foucault, 1977)	Interview Findings	Interpretation & Critical Analysis
Central Tower	<i>Kain Poleng</i> as a Sacred Marker	Visual marker signaling the presence of an unseen supervisory authority.
The Gaze	Supernatural Entities (<i>Sing Mbaureksa</i>)	A perceived supernatural gaze that constantly monitors actions.
Internalization of Discipline	Fear of Supernatural Sanctions (<i>Kualat / Apes</i>)	Triggers a self-disciplining mechanism.
Docile Bodies	Respect for Sacred Spaces	Ecological compliance operates automatically without physical oversight from park rangers.
Power Efficiency	Comparison of Financial Fines vs. <i>Kualat</i>	Cultural surveillance operates 24/7 within individual cognition without patrol budget allocations.

Forest conservation efforts do not merely consider biophysical factors, but also socio-cultural factors, which constitute one of the pillars of environmental sustainability [58]. Socio-cultural factors that prioritise an ecocentric approach tend to emphasise morality [55]. Morality is undoubtedly integrated with spiritual values and local wisdom. In modern environmental policy, this has been shown to enhance the effectiveness of sustainable conservation programmes [59].

Similarly, the existence of the *Poleng* cloth functions as a ‘moral apparatus’ that operates continuously within the consciousness of every individual. Without the need for the physical presence of security personnel, this cultural instrument is able to discipline hikers and local residents not to damage trees, not to litter, and not to pollute sacred water sources. This is also due to a cosmological fear of divine retribution transmitted through the *Poleng* cloth. Thus, Traditional Ecological Knowledge (TEK) possesses a highly operational law enforcement instrument [30]. The existence of the *Poleng* cloth demonstrates how local value systems can fill the gaps left by the limitations of formal monitoring mechanisms in safeguarding the integrity of mountain ecosystems.

4.3 Decolonizing Sustainability Narratives

The contemporary global discourse on sustainability remains heavily fettered by a form of epistemic colonialism, wherein Western carbon-centric metrics and market-driven incentives dictate global environmental policy. This chapter positioned the oral histories of *Poleng* cloth in Mount Arjuno as a radical counter-narrative aimed at reclaiming the sovereign indigenous voice of the Global South. By

articulating a vernacular 'Water Ethics' rooted in ancient cosmic reciprocity, this study demonstrates that Javanese communities possess self-sustaining, low-cost, and empirically proven ecological governance systems that predate and outperform modern Western sustainability dogmas.

Epistemic Colonialism in Global Sustainability

The contemporary global discourse on sustainability is not truly neutral. It is shaped by an epistemic architecture rooted in the Western rationalist tradition of knowledge, which measures ecological success through carbon metrics, quantitative indices and market mechanisms. Criticism of this state of affairs has long been articulated within decolonial scholarship, which focuses on bringing forward non-Western epistemologies to safeguard biological and cognitive diversity and free it from the monocultures of the mind [47]. There is a recurring pattern when we draw a line from colonial-era forestry knowledge to today's sustainability regime: an approach that tends to be cold, devoid of meaning and transactional. This reduces the function of the forest—which was previously understood as a network of relationships between humans and nature (trees, springs and ancestral beliefs)—to a soulless variable, far removed from tradition. This phenomenon is reflected in the behaviour of communities who regard customary rules protecting the forest as having no impact on them; consequently, they often disregard these rules by harvesting large quantities of timber for economic needs (Forestry Officer, Tahura Raden Soerjo, Personal Communication, 2026).

Recent political-ecological studies confirm that decolonial approaches are increasingly revealing how the colonial legacy continues to shape global governance, which often marginalises the knowledge systems of indigenous peoples and local ecological practices [60,61]. Within this framework, recognition of the ecological knowledge of indigenous peoples is not merely a matter of cultural romanticism, but a legitimate scientific and political resource for sustainable governance. In line with this, research on the decolonisation of sustainability is needed to highlight the perspectives of marginalised groups. This research demonstrates that the practices and symbolism of the *Poleng* cloth among communities around Mount Arjuno represent a reciprocal relationship between humans and nature. This ethic treats springs, rivers and hydrological sources not as resources that can be measured mathematically, but as entities bound within a cosmic network (nature-human).

This study is not intended to supersede the Western paradigm of sustainability; rather, it aims to bridge the gap between traditional frameworks and more effective global policies. The practices and symbolism of the *Poleng* cloth amongst the communities around Mount Arjuno represent a living worldview that stands in opposition to Western epistemological logic.

Reclaiming Sovereign Indigenous Practices

Communities living around Mount Arjuno explain that the *Poleng* cloth wrapped around trees is not merely a ritual decoration, but rather a marker of an ecological-spiritual boundary signifying that the trees must not be felled, disturbed or damaged. This phenomenon indirectly forms a collectively managed conservation area, based on cosmological authority passed down from generation to generation.

This practice is not merely a form of local wisdom complementing folklore, but a discovery worthy of being termed the decolonisation of knowledge. The decolonisation of knowledge, within the frameworks developed by Boaventura de Sousa Santos [62] and Walter Mignolo [47], equally rejects the assumption that only knowledge produced by Western scientific methods is considered valid. Meanwhile, traditional methods based on oral traditions are placed lower in the hierarchy, with the claim that myths and superstitions are never recognised as a self-contained system of governance with its own way of thinking. Highlighting the TEK *Poleng* cloth, which has been practised for centuries, proves that local knowledge does not need to be validated by the modern scientific framework; rather, the opposite is true.

Historically, Peluso [20], in his book 'Rich Forest, Poor People: Resource Control and Resistance in Java', demonstrated that the failure of forest governance in Java is a structural legacy of the colonial government, which displaced local systems. Forestry knowledge—such as tree classification systems, teak forest production zoning, and logging licensing systems—was deliberately implemented to replace the systems already in place within Javanese communities. The use of the *Poleng* cloth and traditional oral narratives were not regarded as legitimate systems of forest resource management, but were dismissed as superstitions that needed to be 'modernised'.

The application of *Poleng* cloth along the Mount Arjuno hiking trails possesses significant potential to decolonize Western knowledge, as this system operates independently of state recognition. The practice is executed internally—ranging from the transmission of values and the enforcement of customary/social sanctions (*kualat*) to the communal preservation of traditions—without requiring legitimacy from the central government. This demonstrates that the Traditional Ecological Knowledge (TEK) of *Poleng* cloth is autonomous, originating directly from the local community's culture. Secondly, the regulations governing the placement of *Poleng* cloth on trees and ritual sites are organic in nature; they do not stem from written statutes, but rather evolve from the traditional community's repeated interactions with nature. This phenomenon aligns with Fikret Berkes' theory of sacred ecology, [30] which illustrates the integration of cosmology and ecology within the knowledge-practice-belief framework regarding local ecosystems. This integration forms sustainable protection and utilization practices, both anchored by cosmological beliefs that confer moral and spiritual legitimacy upon the entire system. Lastly, this practice requires no state budget allocations; it is sustained and nurtured by respect and cosmological awe propagated through community narratives. Consequently, the system will not cease due to budget cuts, as it remains deeply rooted in the long-standing beliefs and convictions of the indigenous community across centuries.

4.4 Issues of Environmental Governance in Indonesia

The operational failure of formal forest protection within Indonesia's state-administered conservation areas, such as Tahura, stems from a critical 'structural hole' that alienates indigenous custom from statutory law. This section subjects current environmental governance to rigorous critique, exposing how state-centric models inadvertently trigger a penalty paradox: heavy administrative regulations

dilute local emotional ownership and accelerate cultural erasure. By disregarding the institutional authority of traditional custodians, the state effectively dismantles the organic moral barriers that have historically protected the Arjuno watershed.

Structural Holes in State-led Conservation

The operational failure of forest protection in Indonesia's conservation areas cannot be understood merely as a matter of weak law enforcement. The root of the problem lies in the structural separation between customary law (*hukum adat*) and state law, which leaves indigenous communities without formal authority to serve as forest guardians under the formal legal framework [63]. Legal studies in Indonesia reveal a consistent pattern in which customary law remains in a subordinate position, largely due to overarching economic interests. Consequently, the application of customary law—safeguarding forest and water ecosystems using *Poleng* cloth on Mount Arjuno—relies heavily on the commitment of pilgrims and local community members who adhere to the unwritten norms of applicable customary governance.

Studies on natural resource governance indicate that actors who possess the most relevant ecological knowledge and maintain the closest proximity to forests rarely occupy central positions among policy makers. Yet, integrating the Traditional Ecological Knowledge (TEK) of *Poleng* cloth held by customary leaders into modern environmental policy offers a balanced approach to addressing contemporary ecological challenges [59]. For instance, the traditional practices of stewardship and conservation across the Mount Arjuno region can be integrated into contemporary resource management. This is demonstrated by the behavior of indigenous peoples and pilgrims who treat forest and water ecosystems as sacred through the use of *Poleng* cloth, effectively fostering sustainable practices and offering an environmental protection model that extends beyond formal regulation. Furthermore, indigenous traditional knowledge can be strategically utilized to inform decision-making processes.

Penalty Paradox and Cultural Erasure

The structural inequality inherent in forest management gives rise to what is termed a sanction paradox wherein heavy administrative regulations, rather than strengthening forest protection, weaken the local community's emotional sense of ownership over the forest. This finding aligns with the literature on the motivation crowding effect in conservation policy [65], which indicates that sanction-based management tends to diminish the willingness of local populations to participate in ecosystem stewardship. Conversely, informal management systems grounded in trust and social norms are more readily embraced by indigenous communities. This normative alignment corresponds with the conservation approach practiced by the indigenous community of Mount Arjuno, who manage and safeguard the forest by adhering to prevailing local norms [66]. This practice reinforces the community's cosmological bond and upholds their ancestral responsibility to protect Mount Arjuno as an integral component of the cosmic constellation.

When the state disregards the institutional authority of these traditional guardians, it effectively dismantles the organic moral barrier that has historically protected the Mount Arjuno forest ecosystem. Customary rules—once highly

effective because they were embedded in shared cultural meaning—lose their binding force when relegated to mere cultural norms deemed irrelevant to formal law [63]. Consequently, community members who previously exercised self-restraint out of respect and cosmological attachment come to view forest regulations as external impositions with no direct relevance to their lives. This shift ultimately accelerates resource exploitation in the region [67]. Such transitional phenomena have manifested on Mount Arjuno through activities like timber logging for block production and charcoal making (*pengarengan*), which disregard customary norms governing ecosystem preservation and consequently lead to massive forest degradation.

5 Conclusion

5.1 Synthesis of Findings

The series of findings in this study reinforces that the environmental crisis in the upper slopes of Mount Arjuno cannot be resolved solely through top-down technocratic approaches. Technocratic interventions that rely on formal regulations and physical surveillance prove to have operational weaknesses when confronted with extractive economic pressures and structural poverty. Conversely, the integration of oral history and local eco-spirituality serves as a highly robust mitigation instrument for the contemporary environmental crisis.

Through Traditional Ecological Knowledge (TEK), embodied in the marking of Kain *Poleng*, local communities have successfully established a self-disciplining ecological mechanism. The placement of *Poleng* cloth functions not only as a physical-spatial boundary between profane zones and core ecological spaces, but also acts as a non-physical eco-police rooted in a Cultural Panopticon. Cosmological fear of supernatural sanctions (*kualat*) proves to yield far more efficient and consistent environmental compliance than state-imposed financial fines or criminal threats. Consequently, this local wisdom reclaims the local data sovereignty and knowledge that have long been marginalized by anthropocentric academic forestry paradigms.

5.2 Reclaiming Data Sovereignty Through Pedagogy: Transforming Oral History into Formal Education

Historically, history and social studies education has tended to focus on macro-political narratives while overlooking local historical dynamics oriented toward environmental sustainability. Transforming the TEK of Kain *Poleng* into Social Studies/History instructional materials represents a strategic step toward fostering ecological intelligence in students. This aligns with the perspective of Supriatna [68], who emphasizes the importance of local wisdom in social studies learning:

"In countering global issues related to forest destruction, indigenous communities in various countries possessing local wisdom have proven capable of preserving their forests. Research findings from the World Resources Institute titled 'Securing Rights, Combating Climate Change' report that indigenous peoples across a sample of 14 countries in Africa, Latin America, and Asia demonstrate the capacity to control deforestation. Conversely, handing over forest control to the state or private entities often leads to accelerated deforestation. Thus, traditional values preserved and passed

down through generations to conserve nature serve as a crucial solution to global warming. These values can be utilized by social studies teachers as learning material to build students' ecological intelligence." [68]

Practically, the transformation of the TEK of *Poleng* cloth into the Social Studies/History curriculum can be implemented through three learning schemes:

1. Development of Local Eco-History Based Learning Materials: Incorporating the oral history narratives of the Mount Arjuno region and the concept of *Poleng* cloth as concrete case studies within topics such as social interaction, local wisdom, and sustainable natural resource management.
2. Project-Based Learning: Engaging students to identify and reconstruct oral histories or ecological wisdom in their surrounding environments, enabling them to realize that local traditions possess a scientific-ecological foundation relevant to addressing the global climate crisis.
3. Internalization of Moral Values and Ecological Intelligence: Shifting students' perspectives from viewing local traditions as backward toward recognizing them as respected and preserved environmental conservation instruments.

Through this pedagogical integration, the reconstruction of the oral history and TEK of Kain *Poleng* extends beyond being a mere academic archive; it becomes a social reconstruction tool that reclaims local data sovereignty to safeguard the planet for future generations.

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