



An Ecological Entrepreneurship Learning Model for Indigenous Sundanese Communities: Integrating Local Wisdom, Ecology, and Enterprise for Sustainable Resource Management in Kampung Sunda, West Java

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ABSTRACT

Purpose of the study: This study aims to develop a culturally grounded learning model that integrates Sundanese local wisdom, ecological ethics, and entrepreneurship to strengthen the sustainable management of natural resources within the indigenous community of Kampung Sunda, Desa Laksana, Bandung Regency, West Java.

Methodology: A qualitative descriptive–constructive design was employed. Data were collected through in-depth interviews, participant observation, documentation, focus group discussions (FGD), and SWOT analysis with traditional leaders, community members, and local officials selected purposively. Data were analyzed thematically using the Miles and Huberman interactive model and organized through the Standard Model of Indigenous Learning framework.

Main Findings: An effective learning model must be anchored in Sundanese cosmology *tri tangtu di buana* and *silih asih, silih asah, silih asuh* and enacted through contextual, participatory, active, reflective, and collaborative strategies. Agricultural, forest, water, and biodiversity resources governed through *tumpangsari*, *leuweung titipan*, and collective irrigation support ecological enterprises, while ecologized cultural learning, environment-based modules, holistic assessment, and multi-stakeholder collaboration enhance entrepreneurial knowledge and skills.

Novelty/Originality of this study: This study integrates cultural, ecological, and entrepreneurial dimensions within a single learning model rooted in a living indigenous tradition, operationalized through the Standard Model of Indigenous Learning. It offers a transferable design for ecopreneurship education in indigenous territories and contributes directly to the achievement of SDG 4, SDG 8, and SDG 15.

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1. INTRODUCTION

The integration of indigenous communities into broader socioeconomic frameworks has become increasingly central to debates on sustainable development. Indigenous peoples hold cultural repertoires, value systems, and social institutions that have historically enabled the sustainable use of the territories they inhabit [1]. Yet in recent decades these communities have been reshaped by rapid social and economic change, with consequences that are most visible in how natural resources are perceived and used [2]. In Indonesia, and

specifically across the Sundanese cultural region of West Java, traditional practices and local knowledge are placed at risk by accelerated industrialization, urbanization, and environmental degradation processes that threaten not only the cultural heritage of Sundanese society but also its capacity to steward ancestral land sustainably [3], [4]. The erosion of such knowledge is not merely a cultural loss; because indigenous ecological knowledge functions as a form of adaptive resource management, its decline weakens the very mechanisms that have kept local socio-ecological systems in balance [5], [6].

Ecological entrepreneurship, or *ecopreneurship*, has been proposed as a viable response to this predicament. Emerging from the broader field of sustainable entrepreneurship, ecopreneurship applies entrepreneurial action to environmental problems, treating ecological degradation and market imperfection as sources of opportunity rather than as externalities to be ignored [7], [8]. Sustainable entrepreneurship has since been theorized as the pursuit of ventures that link "what is to be sustained" with "what is to be developed," holding economic, social, and ecological value creation in productive tension [9], [10]. For indigenous communities specifically, ecopreneurship offers a route to develop sustainable business models that honor and preserve cultural identity while fostering economic growth [11], [12]. Implementation, however, remains constrained by limited access to resources and uneven policy support for sustainability-oriented initiatives, and by the absence of an educational architecture through which such enterprise can be cultivated at the community level.

A recurring argument in the literature is that education constitutes a primary pathway for reconciling cultural preservation with economic transformation [13], [14]. Education that foregrounds sustainability and local cultural values can equip younger generations with the knowledge and skills to confront these challenges and to participate actively in the preservation of both environment and heritage [15], [16]. In the Sundanese context, evidence already indicates that learning models grounded in local wisdom can improve engagement and outcomes [17], and that indigenous Sundanese communities such as Kasepuhan Ciptagelar sustain sophisticated ecosystemic governance from which formal institutions can learn [18]. Without a robust model that combines ecological principles with entrepreneurial strategy, however, the sustainability of indigenous regions such as those in the Sundanese area remains precarious [3], [19].

This tension takes concrete form in Desa Laksana, Ibun District, Bandung Regency, which was formally inaugurated as a "Kampung Sunda" (Sundanese Village) by the Regent of Bandung on 12 October 2023. Covering approximately 9.4 km² across four hamlets, Desa Laksana is one of eighteen designated tourism villages in the regency and possesses abundant local assets, including a strongly Sundanese cultural identity. Its local wisdom is a resource capable of supporting sustainable economic development and reinforcing communal identity [20]. As a recently established government pilot project, however, the village faces substantial challenges in integrating local wisdom into wider development practice. Collaborative effort among government, community, and the private sector particularly through educational approaches is required to create programs that both preserve culture and empower residents economically, so that the principle of sustainability can be realized through the cultivation of a learning-oriented community [16].

The urgency of this agenda is heightened by Indonesia's commitments under the Sustainable Development Goals (SDGs). National projections distinguish a business-as-usual trajectory from an intervention scenario in which targeted action closes the gap between current conditions and future targets; for indigenous territories, education is among the most cost-effective interventions available, because it simultaneously addresses SDG 4 (quality education), SDG 8 (decent work and inclusive growth), and SDG 15 (life on land). Desa Laksana, as a newly designated pilot, is precisely the kind of site where such an intervention can be modeled: its cultural assets are largely intact, its ecological base is still productive, and its status as a government showcase creates both the mandate and the visibility for a learning-based approach to be trialed and, if successful, transferred to comparable villages across the region.

Despite a growing literature on entrepreneurial ecosystems and ecopreneurship [21], [22], on knowledge sharing within such ecosystems [23], and on indigenous innovation in village enterprises [24], few studies integrate cultural, ecological, and entrepreneurial dimensions within a single, coherent learning model rooted in a living indigenous tradition. Existing models of learning are often universal in orientation and insufficiently attentive to deep local context. Related work by the present authors on zero-waste training grounded in ecological entrepreneurship demonstrates the promise of the approach at the level of a single competency [25], but a comprehensive model remains to be articulated. This study addresses that gap by constructing a contextual learning model in which Sundanese philosophy and local wisdom serve as the foundation rather than as decorative addition.

Accordingly, the study is guided by three research questions: (1) How can an ecological entrepreneurship learning model be developed for the indigenous Sundanese community? (2) What natural resource potentials in the Sundanese customary territory can be harnessed for ecology-based entrepreneurship? (3) How can the entrepreneurial knowledge and skills of the indigenous Sundanese community be enhanced for the sustainable management of natural resources? The contribution of the study is fourfold. It (a) integrates culture, ecology, and entrepreneurship holistically within one learning model rather than partially; (b) designs a contextual model grounded in living Sundanese values, using cultural narrative, oral tradition, and ritual practice as pedagogical instruments; (c) formulates specific strategies for strengthening sustainable entrepreneurial knowledge and skills

amid ecological transformation; and (d) foregrounds community-based, participatory transmission through family, community, and customary institutions. The remainder of the article situates these questions within a theoretical framework, details the methodology, presents findings organized around the three research questions, discusses their implications for theory and practice, and acknowledges the study's limitations.

2. THEORETICAL FRAMEWORK

The study draws together four bodies of scholarship Sundanese philosophy, ecological wisdom, cultural entrepreneurship, and the educational transmission of culture and organizes them analytically through a model of indigenous learning.

2.1. Sundanese Philosophical Foundations of Learning

In Sundanese culture, the self is not conceived as a separate entity but as an integral part of a wider social harmony. Personhood is bound to relational conduct etiquette, ethical speech, and social propriety expressed in maxims such as *someah hadé ka sémah* (hospitality toward guests), *tepa salira* (empathy toward others), and *silih asih, silih asah, silih asuh* (mutual affection, mutual sharpening, and mutual nurturing). These principles indicate that identity in Sundanese thought is constituted through harmonious, considered relationships rather than through individual assertion. Such values are not confined to abstract discourse; they are transmitted through concrete cultural forms for instance, the moral instruction embedded in *pupuh*, the Sundanese sung-verse tradition, which carries character-educational content across generations [26], and through everyday ritual programs designed to introduce children to Sundanese identity [27].

At a cosmological level, the Sundanese worldview seeks equilibrium among the self, nature, and the divine, articulated in the teaching of *tri tangtu di buana* the division of the cosmos into three realms: *buana nyungcung* (the spiritual or divine), *buana pancatengah* (the human or social), and *buana larang* (the material world). This ontology orients life toward the avoidance of conflict and the maintenance of balance. Its ecological corollary is captured in the adage *leuweung ruksak, cai béak, manusa balangsak* (when forests are destroyed and water runs dry, humanity suffers), which frames the human–nature relationship not as metaphor but as causal and consequential. Ecological consciousness, in this view, is inseparable from moral personhood: a human being is not considered whole without a sense of responsibility toward the environment. This integration of the ethical, the spiritual, and the practical resonates with broader accounts of traditional wisdom as a foundation for sustainable learning, in which knowledge, virtue, and conduct are understood as a single formative process rather than as separable domains [28].

2.2. Ecology as a Pillar of Sundanese Culture

Sundanese ecological ethics are embedded in a relational cosmology in which nature is a partner in life rather than an object for unlimited extraction. This orientation is a specific instance of what the wider literature calls traditional ecological knowledge (TEK): a cumulative, adaptive body of knowledge, practice, and belief that has co-evolved with the environment and functions as a system of resource governance [1], [5]. The concept of *leuweung titipan* (the entrusted forest) holds that forest is neither private property nor commodity but a trust to be safeguarded for future generations, generating an ethic that restrains exploitation. Sacred sites, or *kabuyutan*, mark the limits of human interaction with nature, and the treatment of particular springs, trees, and groves as sacred parallels the role of sacred landscapes in TEK systems elsewhere, where spiritual sanction reinforces conservation behavior [6]. Traditional agrarian knowledge planting patterns attuned to seasons, lunar phases, and customary calendars reflects a sophisticated ecological system in which the farmer is also an observer of nature.

Ritual practices such as *Seren Taun* (harvest thanksgiving), *Mapag Sri*, and *Ngaruat/Ngaruwat Bumi* express and reproduce this relationship, integrating spiritual, ecological, and social dimensions within single cultural events and functioning as collective ecological education. Comparable Sundanese communities demonstrate the durability and contemporary relevance of these systems: Kampung Naga sustains a body of local wisdom that simultaneously mitigates disaster risk and offers a basis for educational tourism [29], while indigenous leaders in Kasepuhan Ciptagelar articulate an eco-systemic philosophy that has, in effect, achieved near-zero-emission living long before such goals entered global policy discourse [18]. Under modernization, however, these value systems have come under strain, as agriculture shifts from subsistence and sustainability toward commercial, market-integrated production, land is converted, water sources are polluted, and relations to nature move from the cosmological to the transactional. Reframing these systems within contemporary education is therefore not nostalgia but a strategy for ecological literacy, cultivating in learners a felt responsibility toward the living world rather than a merely technical understanding of it [15].

2.3. Entrepreneurship in the Logic of Sundanese Culture

Sundanese history combines a strong agrarian tradition with organic commercial activity along the maritime and overland trade routes of the archipelago, from the era of early polities such as Tarumanagara and Pajajaran. Trade was never a purely economic sector; it was embedded in moral values and social structure,

governed by honesty, trust, and responsibility to the community. Expressions such as *dagang ulah rugi batur* (trade should not harm others) and *untung kudu dibagi* (profit must be shared) served as cultural signposts guiding everyday economic conduct. Central to this economic culture is *gotong royong* known in its Sundanese form as *sabilulungan* a philosophy of mutual aid and shared responsibility. In the vocabulary of contemporary social science, *gotong royong* constitutes a dense form of social capital: networks of trust and reciprocity that lower transaction costs, enable collective action, and substitute for formal contract enforcement [30], [31]. Evidence from West Java indicates that such local wisdom continues to shape the financial literacy and creative agency of rural entrepreneurs, mediating how opportunities are recognized and pursued [20].

Ecopreneurship provides the conceptual bridge between this cultural economy and contemporary sustainability. Rather than treating profit and environmental protection as opposed, ecopreneurs build ventures whose competitive advantage derives from ecological value, exploiting market imperfections that conventional firms overlook [7], [8]. Such ventures typically begin small, driven by mission as much as margin, and mature as demand for sustainable goods grows [10], [12]. Recent scholarship has extended the frame from "sustainability" toward "thrivability," conceptualizing entrepreneurial ecosystems that regenerate rather than merely maintain their social and ecological base [32]. For indigenous settings, the challenge is to translate this frame into forms that respect existing knowledge structures; studies of village enterprises show that indigenous innovation is best understood as embedded in local knowledge systems rather than imported wholesale [24]. The transition toward nature-based creative entrepreneurship in Sundanese communities thus builds on longstanding social capital, positioning harmony between humans and environment as its foundation while opening space for innovation responsive to contemporary markets.

2.4. The Educational Transmission of Sundanese Culture

Cultural transmission in Sundanese society rests on the family and community as primary educative units, complemented by customary institutions (*lembaga adat*) that function as centers of non-formal learning. This mode of learning is well described by situated and social theories of education, in which knowledge is acquired through participation in the practices of a community rather than through decontextualized instruction [33], [34]. Knowledge is conveyed not only through direct verbal instruction but through narrative, symbol, and expressive art oral literature (*pantun*, *sisindiran*, *wawacan*), symbolic dress and ritual, and performance forms such as *wayang golek* and *tembang Sunda*. Because such learning is anchored in a specific landscape and community, it exemplifies place-based education, which links learning to the ecological and cultural particularities of a locale and thereby deepens both engagement and stewardship [35], [36].

Within formal schooling, local-content curricula (*muatan lokal*) offer a channel for integrating cultural and ecological values, provided they are designed contextually and with the participation of custodians of culture rather than as normative add-ons. Critical and emancipatory pedagogy is instructive here: education that begins from learners' own social and cultural reality positions them as subjects rather than objects of the educational process, capable of acting upon their world [37]. Evidence from West Java confirms that Sundanese local-wisdom-based learning models can improve student outcomes when implemented with fidelity [17], and that carefully designed instructional media can raise learner interest and participation [38]. Digital media, in turn, increasingly extend the reach of cultural learning, though their use requires care to preserve authenticity and avoid the commodification of cultural meaning. More broadly, this agenda sits within education for sustainable development, which foregrounds the competencies and dispositions needed to act for a sustainable future [14], and within emerging curricular models that couple green-economy content with contextual pedagogy [39], [40].

2.5. An Indigenous Learning Lens: The Standard Model of Indigenous Learning

To integrate these strands analytically, the study adopts the Standard Model of Indigenous Learning (SMIL), which characterizes indigenous pedagogy through five interrelated dimensions: *place* (learning rooted in a specific landscape and territory), *storytelling* (knowledge carried through narrative and oral tradition), *intergenerational interaction* (transmission across generations), *experience* (embodied, practical learning), and *interconnectedness* (a relational worldview linking humans, nature, and the divine). This lens resonates with evidence that horizontal, community-based knowledge exchange can effectively empower communities to address environmental and social challenges [41], and with work on indigenous innovation and appropriate technology in village and community settings [24], [42]. Its five dimensions map closely onto Sundanese practice: *place* onto the fields, forests, and *kabuyutan* of the customary territory; *storytelling* onto *pantun* and *dongeng*; *intergenerational interaction* onto the authority of *sesepuh* and *lembaga adat*; *experience* onto participation in agriculture and ritual; and *interconnectedness* onto *tri tangtu di buana*. SMIL thus provides the organizing framework through which the study reads the Sundanese cultural material and constructs the proposed learning model.

3. RESEARCH METHOD

3.1. Design and Analytical Flow

The study employs a qualitative approach using a descriptive–constructive method. This design was chosen to probe the empirical conditions surrounding the development of an indigenous community learning model based on ecological entrepreneurship, and to construct a conceptual model grounded both in field realities and in theoretical review [43]. As applied research, it aims to generate knowledge of practical benefit to the community. Analysis followed an interactive cycle of *data reduction* (simplifying, categorizing, and discarding extraneous data to yield meaningful information), *data display* (organizing data systematically into narrative text, matrices, charts, or networks to reveal patterns), and *conclusion drawing and verification* (identifying relationships, similarities, and differences and testing preliminary conclusions against subsequent evidence until credible conclusions are reached), consistent with established procedures for qualitative data analysis [44].

3.2. Setting and Participants

Fieldwork was carried out in Kampung Sunda, Desa Laksana, Ibun District, Bandung Regency. The site was selected because it is a formally inaugurated pilot "Sundanese Village" whose ongoing programs align closely with the study's objectives, and because it represents a regency-level pilot for preserving Sundanese culture and sustaining ecologically prudent local wisdom. Participants were selected through purposive sampling and comprised community figures, customary (*adat*) leaders, villagers, and local government representatives. Selection was based on participants' knowledge of, and experience with, Sundanese culture, natural resource management, and entrepreneurial potential in the customary territory, so that information-rich cases could be examined in depth.

3.3. Data Collection

Instruments were designed to serve the aims of qualitative data collection, drawing on three principal techniques [45]: (a) *in-depth interviews*, guided by protocols exploring strategies for cultural preservation, the use of natural resources, economic and entrepreneurial values, and the transmission (learning) of Sundanese culture through family, school, and community; (b) *direct observation*, recording everyday community activities, notable events, and behaviors relevant to the study's focus; and (c) *documentation study*, drawing on reports, journals, and news sources related to the research topic. Focus group discussions (FGD) and SWOT analysis complemented these techniques for specific questions, providing a collective forum in which community members could deliberate on resource potential and learning priorities. To guide data collection, a research grid was developed, as summarized in Table 1.

Table 1. Research grid (kisi-kisi)

No.	Research question	Variable	Indicators	Technique
1	How can an ecology-based entrepreneurship learning model be developed for the indigenous Sundanese community?	Ecology-based entrepreneurship learning model	(1) Traditional learning methods of the indigenous community; (2) Ecological entrepreneurship elements; (3) Local wisdom in learning	In-depth interview, FGD, observation
2	What natural resource potentials in the Sundanese customary territory can be harnessed for ecology-based entrepreneurship?	Natural resource potential of the customary territory	(1) Types and quantity of natural resources; (2) Traditional use by the indigenous community; (3) Innovation in resource use	SWOT analysis, FGD, observation, interview
3	How can entrepreneurial knowledge and skills be enhanced for sustainable resource management?	Standard Model of Indigenous Learning (SMIL)	(1) Place; (2) Storytelling; (3) Intergenerational interaction; (4) Experience; (5) Interconnectedness	Interview, observation, training program, FGD

3.4. Data Analysis

Data were analyzed thematically to identify recurring patterns and principal themes across interviews and observations [46]. Following familiarization with the material, initial codes were generated and collated into candidate themes, which were then reviewed against the coded extracts and the full dataset, defined, and named. Coding was oriented by, but not confined to, the SMIL dimensions, allowing both framework-driven and data-driven themes to emerge. Results were then integrated to yield a comprehensive understanding of the learning model in the Sundanese customary context.

3.5. Trustworthiness and Ethics

Trustworthiness was addressed using established criteria for naturalistic inquiry credibility, transferability, dependability, and confirmability [47]. Credibility was pursued through methodological triangulation, combining interviews, observation, and documentation, and through expert validation of instruments; transferability through thick description of the setting and participants; and dependability and confirmability through an auditable record of the analytical process. The study adhered to research ethics principles. Consent was obtained from the Desa Laksana authorities and all participants through formal correspondence grounded in a memorandum of understanding between the university and the local government. Each informant received a full explanation of the study's aims and procedures; participation was voluntary and free from coercion; and the confidentiality of informants' identities and data was fully protected, allowing participants to speak freely about critical issues observed in the community.

3.6. Field Engagement and Documentation

Data collection was conducted through direct engagement with the community in Desa Laksana, including group sessions with community and customary leaders. Figures 1 and 2 document these field activities, in which the research team convened residents, customary figures, and local stakeholders for discussion and focus group deliberation on cultural preservation, natural resource potential, and learning priorities.



Figure 1. Research team with community members and customary leaders during a field engagement session in Kampung Sunda, Desa Laksana, Ibun District, Bandung Regency



Figure 2. Focus group discussion with residents and customary figures facilitated by the research team, Desa Laksana

4. RESULTS AND DISCUSSION

The findings are organized around the three research questions: the construction of the learning model; the natural resource base for ecological entrepreneurship; and strategies for enhancing entrepreneurial knowledge and skills.

4.1. A Contextual Ecological Entrepreneurship Learning Model for the Indigenous Sundanese Community

The proposed model is a holistic effort to integrate local wisdom, ecological values, and entrepreneurial principles within a contextual and participatory educational framework. Its purpose is not merely to transfer knowledge but to form character that is at once environmentally conscious and economically productive, consistent with the Sundanese philosophy of life.

Theoretical grounding. The model rests on contextual learning theory, which emphasizes the linkage between subject matter and learners' real experience in their social and cultural environment, and on constructivism, which regards learning as an active process in which learners build knowledge from their own experience [33], [34]. Sundanese culture is positioned as the central element both object of study and source of pedagogical strategy requiring educators to understand deeply the values, traditions, language, and living practices of the community so that learning proceeds naturally and meaningfully. This is consistent with evidence that Sundanese local-wisdom-based models improve learning outcomes when culture is treated as foundational rather than supplementary [17]. The model is learner-centered, with the teacher acting as facilitator, thereby encouraging autonomy, creativity, and problem-solving in relation to real challenges rooted in local culture and environment [37].

Architecture of the model. The model can be read as a sequence of layers moving from foundation to outcome: a *philosophical foundation* in Sundanese cosmology and ethics; *pedagogical principles* of contextual, constructivist, learner-centered learning; *learning strategies* that are active, reflective, and collaborative; *enactment* through cultural entrepreneurial projects; and *outcomes* in the form of character and ecological ethos. Learning resources are drawn from the immediate environment physical (nature, traditional agriculture, crafts) and non-physical (folklore, song, ritual) which enriches material while strengthening learners' emotional bond and cultural identity, in keeping with the logic of place-based education [35].

Operationalizing the indigenous learning lens. The five dimensions of SMIL provide concrete design guidance, as summarized in Table 2.

Table 2. Operationalizing SMIL within the learning model

SMIL dimension	Meaning	Operationalization in the model
Place	Learning rooted in the local landscape and territory	Fields, forests, rivers, and sacred sites (<i>kabuyutan</i>) function as living classrooms; place-based projects
Storytelling	Knowledge carried through narrative and oral tradition	<i>Pantun</i> , <i>wawacan</i> , <i>pupuh</i> , and <i>dongeng</i> (e.g., <i>Lutung Kasarung</i>) as pedagogical texts conveying ecological and ethical meaning
Intergenerational interaction	Transmission across generations	Elders (<i>sesepuh</i>), <i>adat</i> leaders, and family serve as co-educators in non-formal settings
Experience	Learning through direct, embodied practice	Participation in agriculture, ritual, and micro-enterprise; project-based and experiential tasks
Interconnectedness	A relational worldview linking humans, nature, and the divine	<i>Tri tangtu di buana</i> and <i>leuweung ruksak</i> , <i>cai béak</i> , <i>manusa balangsak</i> framed as organizing principles

Learning strategies. The model foregrounds active, reflective, and collaborative strategies. *Active learning* engages learners directly in problem-solving, discussion, and experimentation observing customary ritual, practicing traditional agriculture, or developing nature-based products so that abstract concepts are grounded in concrete experience [34]. *Reflection* invites learners to appraise critically the relationship between theory and practice and the consequences of their actions for environment and community, reinforcing cultural values and responsibility in resource management. *Collaboration* emphasizes cooperation toward shared goals for example, the collective management of a traditional craft enterprise enhancing communication and enabling the exchange of diverse perspectives, and thereby reproducing in the classroom the *sabilulungan* logic that structures Sundanese communal economy [31]. Together these strategies create a dynamic, inclusive learning environment in which learners become self-directed and the teacher serves as facilitator.

Values-in-practice through entrepreneurial projects. The model enacts cultural values across the full arc of an enterprise planning, production, distribution, and marketing guided by *silih asih*, *silih asah*, *silih asuh*.

Projects begin with the exploration of local potential and the use of natural raw materials such as bamboo, rattan, palm leaf, or agricultural residue, reflecting the principle of *nyunda* enterprise that does not damage the natural and social order. In production, the principle of *tata titi* (order and precision) governs quality and work ethic, while distribution and marketing observe social norms of honesty and courtesy. Such projects also cultivate collective, democratic work dividing tasks by expertise and reaching decisions through deliberation (*musyawarah*) thereby serving as effective media for social learning and supporting the aims of holistic character education. This mirrors, at the scale of a learning project, the mission-driven and value-embedded character of ecopreneurial ventures documented in the wider literature [7], [12].

Character and ecological ethos. The intended character extends beyond narrow discipline or honesty to encompass care for others, compassion toward nature, and responsibility for ecologically consequential decisions. Values such as *leuleus*, *lembut*, *luwes* (supple, gentle, adaptable) are reframed not as weakness but as social and ecological sensitivity. The ecological ethos positions nature as a partner to be respected rather than an object to be exploited (*kudu nyaho kana tatakrama ka alam* one must know the etiquette owed to nature), an orientation that cultivates ecological literacy as a disposition rather than a body of facts [15]. Project-based environmental activities school greening with endemic species, community-based waste management, revitalization of small organic plots together with everyday habituation (energy saving, prudent water use, local food consumption, reuse) embed these dispositions. The teacher functions as a role model whose conduct demonstrates commitment to cultural and ecological values, and assessment relies on authentic methods such as reflective journals, behavioral observation, action portfolios, and open interviews.

4.2. Natural Resource Potential for Ecological Entrepreneurship

The customary territory of Desa Laksana holds abundant natural resources historically governed through strong local wisdom, providing a strategic basis for ecology-based entrepreneurship oriented toward both economic benefit and environmental and cultural preservation. Observation and documentation identified four resource domains and their associated traditional management and innovation potential, summarized in Table 3.

Table 3. Resource domains, traditional management, and ecopreneurial innovation

Resource domain	Traditional management	Ecopreneurial innovation
Agriculture (rice, vegetables, <i>palawija</i>)	<i>Tumpang Sari</i> (intercropping), crop rotation, organic fertilizer from harvest residue and manure, traditional irrigation	Certified organic produce (organic rice, fresh vegetables); healthy processed foods
Forest (bamboo, medicinal plants, timber)	<i>Leuweung titipan</i> (entrusted forest); selective, non-excessive harvesting	Nature-based crafts (bamboo weaving, musical instruments, décor) integrating Sundanese motifs
Water (rivers, springs)	Collective irrigation governed by customary institutions	Small-scale micro-hydro energy; clean-water-dependent value chains
Flora and fauna (endemic species)	Ethno-knowledge of local plants and animals	Herbal products, health teas, natural cosmetics; biodiversity-based ecotourism

The territory's fertile land supports rice, vegetables, and secondary crops, sustained by a functioning traditional irrigation system; its surrounding forest holds high biodiversity, including varied bamboo, medicinal plants, and timber; its rivers and springs supply adequate clean water for agriculture and daily needs; and its endemic flora and fauna form part of the local ecosystem. Longstanding management practices intercropping and rotation, the *leuweung titipan* ethic of conservation-minded and selective harvesting, collectively governed irrigation, and the use of local plants for medicine and craft constitute significant capital for ecological entrepreneurship. These practices are not merely productive techniques but expressions of traditional ecological knowledge, in which resource use is bounded by ethical and spiritual norms that protect the resource base over the long term [5], [6].

Read through a SWOT lens, this resource base presents clear strengths and opportunities alongside definable threats. The principal strengths are the intact traditional management systems and the dense social capital that coordinates them; the principal opportunities lie in rising urban demand for organic, artisanal, and experiential goods, and in digital channels that connect a remote village to distant markets. The salient weaknesses are limited access to capital, certification, and technical training, while the external threats are the same forces of land conversion, market volatility, and cultural commodification that modernization brings. The learning model is designed to convert strengths into enterprises and to buffer threats: it builds the missing competencies certification, product development, digital marketing upon the existing base of local wisdom rather than displacing it, so that economic diversification increases resilience rather than exposure [20].

These resources can be translated into several enterprise pathways. *Certified organic products* can be marketed to urban centers with high demand for healthy, environmentally friendly goods, capturing value from precisely the sustainability attributes that ecopreneurship theory identifies as sources of advantage [8]. *Nature-based crafts* from bamboo, natural fiber, or agricultural residue can carry Sundanese motifs and command higher artistic and economic value. *Community-based ecotourism* can offer authentic experiences of Sundanese culture and ecological wisdom visits to traditional farms, craft-making, and customary ceremonies with *kabuyutan* serving as sites of spiritual and educational interest; the demonstrated potential of Sundanese communities such as Kampung Naga for educational tourism indicates the viability of this pathway [29]. *Herbal and natural cosmetic products* can be derived from local medicinal plants, and *small-scale renewable energy* (micro-hydro) can supply community electricity while functioning as a sustainable business model. These pathways are reinforced by strong social capital *gotong royong* and an ethic of honest trade and can be extended through digital platforms that widen market access while educating consumers about the cultural values and sustainability embodied in each product [48].

4.3. Enhancing Entrepreneurial Knowledge and Skills for Sustainable Resource Management

Strengthening the community's entrepreneurial knowledge and skills for sustainable resource management requires an integrated, contextual, and collaborative educational approach spanning several dimensions and the active involvement of multiple stakeholders.

Ecologization of cultural learning. Enhancement begins by integrating ecological values into cultural learning material teaching maxims such as *leuweung ruksak*, *cai béak*, *manusa balangsak* not only as expressions but as principles of life that shape environmentally responsible conduct. Developing such material demands a multidisciplinary approach that combines environmental science, cultural anthropology, and education, and that introduces tested traditional practices such as intercropping and customary forest management. This aligns with education for sustainable development, which treats sustainability not as an add-on topic but as an orientation permeating the whole of learning [14], [40].

Contextual and participatory pedagogy. Skill development depends on placing learners' experience and environment at the center of learning. Contextual teaching refers to living local values, norms, and practices learning about water management, for instance, by visiting a traditional irrigation system and understanding how the community governs it [36]. Participation positions learners as active agents through dialogue, discussion, collaborative projects, and shared reflection developing local products, examining resource-management cases, or undertaking conservation activities [37]. Community members, customary leaders, and local entrepreneurs act as resource persons, mentors, and partners, providing direct experience that reinforces cultural and ecological understanding beyond the classroom a form of horizontal knowledge exchange shown to be effective for environmental management [41].

Environment-based modules. Structured enhancement requires modules that use local natural resources and culture as primary teaching material, enabling learners to study directly from their everyday context and strengthening the link between theory and practice. Such modules should emphasize proven local wisdom (intercropping, traditional irrigation), be developed with the involvement of customary leaders, local practitioners, and the community to ensure cultural and ecological accuracy, and incorporate concepts and practices of sustainable business case studies of organic produce processing or nature-based, environmentally friendly craft production. The authors' prior work on zero-waste training grounded in ecological entrepreneurship illustrates how such modular, practice-oriented content can be delivered to build a specific competency, and offers a template for scaling to a fuller curriculum [25].

Holistic assessment. Assessment must move beyond cognitive measurement to integrate knowledge, attitude, and skill. It should employ varied techniques (direct behavioral observation, reflective notes, learning journals, portfolios), focus on process and transformation rather than only final outcomes for example, use of the Sundanese language, participation in customary activities, and application of sustainability principles and involve family, customary leaders, and community as evaluators who provide authentic perspective on behavioral change in real settings. Character and ecological ethos strengthening. Enhancement is sustained by the formation of holistic character care for others, compassion toward nature, and ecologically responsible decision-making supported by an ethos that treats nature as a partner (*kudu nyaho kana tatakrama ka alam*). Project-based environmental activities, habituation of ecological values in daily life, and teachers acting as role models together embed these dispositions, and can be reinforced by targeted efforts to raise the environmental literacy of educators themselves [49].

Social transformation through education. Ultimately, enhanced knowledge and skill drive social transformation. Culture-oriented education empowers the community by revitalizing local wisdom and developing culture-based economic activity, thereby strengthening social and economic resilience; it reinforces local identity amid globalization, helping the community filter external information critically; it depends on synergy among family, customary community, cultural figures, artists, academics, business, and government; and it must remain

adaptive to challenges such as climate change and urbanization through digital media, project-based learning, and cross-disciplinary approaches capable of reaching younger generations in both urban and rural settings [39].

The findings converge on a central proposition: an effective learning model for the indigenous Sundanese community must be anchored in Sundanese cosmology and ethics and enacted through contextual, participatory practice. Several implications warrant emphasis. First, the study's principal theoretical contribution lies in the *holistic integration* of three domains culture, ecology, and entrepreneurship within a single learning model. Whereas prior scholarship has examined entrepreneurial ecosystems and ecopreneurship [21], [22] and knowledge sharing within such ecosystems [23], it has tended to treat these domains separately or to combine them partially. The sustainable-entrepreneurship literature supplies the logic of value creation across economic, social, and ecological dimensions [7], [9], [10], and the "thrivability" turn extends this toward regenerative ecosystems [32]; yet these frameworks rarely specify how such enterprise is to be cultivated within a living indigenous culture. Positioning Sundanese philosophy and local wisdom as the model's foundation rather than as ornament extends the argument that sustainable development strategies can be built on indigenous knowledge and entrepreneurship [11] by specifying *how* such integration can be pedagogically enacted in a specific cultural context.

Second, operationalizing the model through the Standard Model of Indigenous Learning connects the study to indigenous and place-based pedagogy and to evidence on community-based knowledge exchange. The dimensions of place, storytelling, intergenerational interaction, experience, and interconnectedness align with the theory of place-based and critical-place education [35], [36], with situated theories of learning [33], [34], and with findings that horizontal knowledge exchange empowers communities for environmental management and governance [41]. It also aligns with work on indigenous innovation in village enterprises and appropriate technology in community settings [24], [42]. The model thus offers a structured way to translate the abstract commitment to "local wisdom" into concrete learning design, complementing evidence that Sundanese local-wisdom-based models can raise learning outcomes [17] and that Sundanese cultural forms such as *pupuh* carry robust educational value [26].

Third, the resource analysis demonstrates that ecological entrepreneurship in the Sundanese context need not be extractive. Traditional practices such as *tumpangsari*, *leuweung titipan*, and collectively governed irrigation already embody the conservation logic of traditional ecological knowledge, in which resource use is bounded by ethical and spiritual norms [1], [5], [6]. The enterprise pathways they enable organic agriculture, nature-based crafts, community ecotourism, herbal products, and micro-hydro rest on the same social capital of *gotong royong* and honest trade that has long structured Sundanese economic life [30], [31], and on the demonstrated capacity of Sundanese communities for eco-systemic living and educational tourism [18], [29]. This is consistent with earlier arguments for eco-culturally grounded entrepreneurship training as a route to empowering rural communities [19], with evidence that local wisdom shapes the financial and creative agency of rural West Javanese entrepreneurs [20], and with the authors' own work demonstrating the feasibility of ecological-entrepreneurship training in the Bandung setting [25].

Two further considerations qualify and strengthen the model. The first concerns inclusion. Because Sundanese women have historically been custodians of language, cuisine, craft, and everyday cultural memory, and are central actors in traditional markets, a learning model that mobilizes household and community transmission necessarily foregrounds their agency; extending digital economic and marketing literacy to women's groups in rural areas is one concrete avenue for translating this cultural role into economic empowerment [48]. Attending explicitly to women and to other marginalized groups guards against a romanticized reading of "community" that obscures internal inequality. The second consideration concerns the risks that accompany market engagement. Modernization exerts pressure toward overconsumption, land conversion, and the commodification of culture, and ecopreneurial ventures are not immune: scaling can, paradoxically, amplify environmental impact if growth outruns ecological limits [7]. The model manages this tension by embedding ethical constraints *nyunda*, *tata titi*, and the injunction against taking more than one needs directly into the learning process, so that restraint is cultivated as a competence rather than imposed as an external rule. In this respect the model treats sustainability not as a fixed endpoint but as an ongoing, reflexive practice [14], [32].

The practical implications are differentiated by stakeholder. For *communities*, the model supports the revitalization of customary institutions as centers of non-formal learning and as initiators of culture- and ecology-based enterprise. For *educational institutions*, it offers a template for local-content curricula that are contextual, adaptive, and transformative rather than normative additions, and that can be supported by carefully designed instructional media [38] and by green-economy curricular models [39]. For *local government*, it provides a basis for policy and budgetary support that aligns cultural preservation, environmental protection, and economic empowerment, including investment in the environmental literacy of teachers [49]. For *micro-enterprises*, it models a form of enterprise oriented to sustainability and cultural preservation as well as profit, extended through digital economic literacy and marketing capacity [48]. Collectively, these implications advance the localization of Sustainable Development Goals 4 (quality education), 8 (decent work and economic growth), and 15 (life on land), narrowing the gap between present conditions and future targets that motivated the study, and they extend education for sustainable development into a culturally specific register [13], [14], [16]. In doing so, the model

complements existing accounts of Sundanese cultural survival [3] by proposing an actionable educational mechanism rooted in a conception of traditional wisdom as a foundation for sustainable learning [28] through which such survival can be pursued.

Viewed as a whole, the model's distinctiveness lies less in any single component than in their integration: it is neither a generic entrepreneurship curriculum with cultural flavoring, nor a heritage-preservation program with an economic afterthought, but a design in which culture supplies the epistemology, ecology supplies the ethic, and enterprise supplies the vehicle. This integration responds directly to a recurring critique of education for sustainable development that it too often remains abstract, universalized, and disconnected from the lived worlds of learners [14], [15]. By grounding sustainability competencies in a specific cosmology and a specific landscape, and by routing them through the community's own institutions of transmission, the model offers a route from global principle to local practice that other indigenous and rural settings might adapt, with due attention to their own knowledge systems [1], [41].

Several limitations should be acknowledged. The study is a single-site, model-development inquiry conducted in one pilot village; its findings are analytically rather than statistically generalizable, and transferability to other Sundanese or indigenous contexts requires further investigation, supported by the thick description provided here [47]. As a descriptive–constructive study, it constructs and argues for a conceptual model grounded in qualitative fieldwork and literature synthesis; it does not report experimental or longitudinal evidence of the model's effects on learning outcomes, enterprise performance, or environmental indicators. The empirical base would be strengthened by richer presentation of primary data, including participant accounts and detailed specification of the sample. Future research should therefore (a) test the model's effectiveness at larger scale and across varied geographic and sociocultural contexts; (b) develop specific, measurable indicators of learners' cultural and ecological uptake and of long-term community wellbeing; and (c) examine the model's implementation across the three projected settings community, school, and micro-enterprise together with the multi-stakeholder collaboration identified as central to its success. Comparative and international dialogue with communities facing analogous challenges may further position Sundanese local wisdom as a contribution to global models of ecological learning.

5. CONCLUSION

This study set out to develop an ecological entrepreneurship learning model for the indigenous Sundanese community, to identify the natural resource potential of the customary territory, and to formulate strategies for enhancing entrepreneurial knowledge and skills for sustainable resource management. It reaches three conclusions. First, an effective model must be rooted in the philosophical foundations of Sundanese culture values such as *tri tangtu di buana* and *silih asih*, *silih asah*, *silih asuh* that hold in balance the relations among human beings, nature, and the divine and enacted through contextual and participatory pedagogy and active, reflective, and collaborative entrepreneurial projects that form environmentally conscious, economically productive character. Second, the customary territory offers abundant and varied resources agriculture, forest, water, and local biodiversity that can be developed innovatively for ecology-based enterprise, from organic products and nature-based crafts to community ecotourism, herbal goods, and small-scale renewable energy, while upholding sustainability and cultural ethics. Third, knowledge and skills can be enhanced through the ecologization of cultural learning, contextual and participatory teaching, environment-based modules, holistic assessment, and character formation, sustained by collaboration among family, community, school, government, and micro-enterprise. Taken together, the study affirms that Sundanese culture, with its accumulated local wisdom, provides a strong foundation for a learning model that is relevant, adaptive, and sustainable one that not only preserves cultural and ecological heritage but also improves the wellbeing of the indigenous community amid the pressures of modernization and globalization.

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AUTHOR CONTRIBUTIONS

Conceptualization, N.S. and S.; Methodology, N.S. and H.S.H.; Validation, S. and H.S.H.; Formal Analysis, N.S. and D.A.K.; Investigation, H.W. and P.; Resources, P.; Data Curation, H.W.; Writing – Original Draft Preparation, N.S. and S.; Writing – Review & Editing, H.S.H. and D.A.K.; Visualization, D.A.K.; Supervision, S.; Project Administration, H.S.H.; Funding Acquisition, S.

INFORMED CONSENT STATEMENT

Informed consent was obtained from all subjects involved in the study. Consent was obtained from the Desa Laksana authorities and all participants through formal correspondence grounded in a memorandum of understanding between the university and the local government. Each informant received a full explanation of the study's objectives and procedures; participation was voluntary and free from coercion; and the confidentiality of informants' identities and data was fully protected.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

Not applicable.

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