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CULTURAL SPACES SUSTAINING ORANG ASLI NATURE–CULTURE KNOWLEDGE AND WISDOM

**Aisyah Abu Bakar¹, Nurul Amirah Laili², Siti Husna Awalluddin³,
Mariana Mohamed Osman⁴**

*^{1,2,3}Department of Environmental Management,
Faculty of Forestry and Environment,
UNIVERSITI PUTRA MALAYSIA*

*⁴Department of Urban and Regional Planning,
Kulliyah of Architecture and Environmental Design,
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA*

Abstract

This paper maps landscapes, rivers, celestial settings, healing areas and household spaces sustaining Orang Asli (OA) knowledge under Intangible Cultural Heritage (ICH) Domain 4. Evidence remains scattered across practices, beliefs and environmental settings, limiting interpretation as a coherent, place-based nature–culture system. The study combined interviews with OA knowledge holders and representatives with ethnographic sources, literature and heritage reports. Content analysis identified manifestations by knowledge function, setting, cultural meaning, practice and community context. Inductive-deductive thematic analysis organised them into codes, facets and themes. Six experts assessed the framework using the Content Validity Index, informing four themes and sixteen facets. These cover ecological landscapes, riverine systems, celestial-cosmological knowledge, therapeutics, healing and foodways. Spatial interpretation generated five conceptual layers and ten cultural spaces, including routes, customary territories, renewal landscapes, species habitats, river networks and sacred water sites. The framework supports landscape mapping, conservation zoning, river protection, resource safeguarding and culturally sensitive development control.

Keywords: Orang Asli, Indigenous Knowledge, Nature–Culture Systems, Intangible Cultural Heritage, Cultural Landscape

¹ Corresponding author. Email: aisyah.ab@upm.edu.my

INTRODUCTION

This paper is positioned within a broader initiative to catalogue and organize Orang Asli [OA] Intangible Cultural Heritage [ICH] across five ICH domains, with this study devoted specifically to Domain 4, Knowledge and Practices, concerning Nature and Universe.

OA knowledge and wisdom in Peninsular Malaysia is shaped through forests, rivers, celestial cycles, medicinal resources and household practices. Distinct from OA ICH papers on oral traditions, performing arts and social practices, this paper examines ecological, hydrological, celestial-cosmological and therapeutic-foodway knowledge as connected nature-culture systems. The study develops an expert-informed framework for translating knowledge manifestations into cultural landscapes to support environmental stewardship, heritage mapping, and safeguarding.

LITERATURE REVIEW

OA knowledge and wisdom develop through sustained engagement with forests, rivers and ecological cycles, where observation, belief and practice guide subsistence, healing and resource management (Diansyah et al., 2022; Haq et al., 2023). Land is understood through use rather than as an abstract mapped surface. Movement, foraging and cultivation rely on remembered routes, landmarks and customary tenure, while forests are differentiated by access rules, taboos and permitted activities (Dong et al., 2022; Wook et al., 2020). Ecological knowledge also informs seasonal decision-making and respectful relations with non-human beings (Tharmabalan, 2023). Cosmological understanding is embedded in ritual timing, lunar observation and spiritual interpretations of environmental balance, although it is less explicitly documented than observable practices (Jaafar, 2021; Sinthumule, 2023). Healing knowledge is more visible, particularly through medicinal plants, wild foods and preventive care, which connect health to everyday use of natural resources (Abdullah et al., 2021; Jessen et al., 2022).

Navigational and hydrological knowledge further demonstrates how environment and culture are interwoven. Rivers support movement, settlement and resource access (Praveena et al., 2025; Abdul Wahab & Manaf, 2020). Together, forests, rivers, cultivation areas, gathering routes, healing-resource sites and sacred locations function as cultural spaces where knowledge is learned and applied. Heritage mapping can help relate physical features to customary boundaries, seasonal use, access patterns, ecological functions and spiritual meanings. Existing studies tend to examine ethnobotany, healing and land use separately, with less attention given to their connections with cosmological and water-related knowledge (Kamaruddin & Said, 2021; Tharmabalan, 2023). A Domain 4 framework is needed to thematically explore OA knowledge subtypes and recognizing ecosystems as cultural spaces, strengthening documentation, heritage planning, and community-led safeguarding.

METHODOLOGY

This paper draws from continuing research that documents and classifies OA ICH across five domains. While the companion papers apply related stages of extraction, coding, thematic analysis and expert validation, this study adapts the process to Domain 4: Knowledge and Practices Concerning Nature and the Universe. Its focus is on ecological knowledge, riverine understanding, botanical use, healing, foodways, celestial interpretation and cosmological relationships.

The corpus comprised interview transcripts with OA knowledge holders and community representatives, supplemented by ethnographic records, academic publications and heritage reports. Content analysis was used to identify knowledge-based manifestations connected to forests, rivers, plants, animals, weather, water systems, healing resources, food practices, seasonal indicators and spiritual-ecological meanings. In this paper, knowledge is translated as practical, environmental and cosmological understanding that guides resource use, movement, care, ritual timing and human–nature relations. Each manifestation was coded by knowledge function, ecological setting, cultural meaning, associated practice and community context. The coded materials were then organized through inductive-deductive thematic analysis into manifestation codes, facets and themes. OA cultural and heritage experts assessed the framework using the Content Validation Index [CVI] for clarity, relevance, coherence and cultural suitability.

Table 1: Framework Development Stages

Phase	Description of Process	Output
Stage 1: Data Extraction and Coding	Interview transcripts and documents were analyzed using content analysis in ATLAS.ti to identify OA ICH Domain 4 manifestations. Knowledge function, cultural meaning and environmental context were recorded.	Dataset of identified ICH manifestations, segmented corpus of data excerpts
Stage 2: Coding of ICH Manifestations under Domain 4	Identified manifestations were assigned manifestation codes to organize recurring ecological and cosmological knowledge, foodways, and healing practices.	Coded dataset of OA Knowledge and Wisdom
Stage 3: Categorization of Themes and Facets	Coded manifestations were grouped into facets and organized into themes using thematic analysis to refine conceptual groupings within each theme and facet.	Structured set of themes and corresponding facets
Stage 4: Framework Drafting	Themes and facets were structured into a conceptual framework, mapping relationships into a coherent visual matrix guided by theoretical reasoning.	Initial framework showing classification hierarchy
Stage 5: Iterative Refinement	The framework was reviewed against coded data using thematic analysis to improve clarity, consistency and reduce overlap between codes, facets and themes.	Refined ICH Domain 4 framework ready for validation
Stage 6: Validation Preparation	The framework was converted into a validation tool with definitions of themes and facets and manifestation codes as well as guidance for expert evaluation.	Validation package with framework and scoring sheets
Stage 7: Validation Study Execution	Experts evaluated the framework, and I-CVI and S-CVI were calculated to assess content validity.	Expert feedback and CVI scores
Stage 8: Framework Refinement	Validation results were used to revise labels, structure, and grouping for improved coherence.	Revised Framework of OA ICH Domain 4

Semi-Structured Interviews

The semi-structured interviews used an open thematic guide to encourage participants to explain knowledge practices in their own order and narrative style. The guide began with settlement background, household context, social organization, livelihood conditions, governance, environmental surroundings and heritage continuity. Following this flow, the questions then explored OA nature-culture knowledge covering forest and river knowledge, plant and animal uses, healing resources, food practices, water-related practices, weather indicators, celestial observation, seasonal signs, sacred ecological meanings and human–nature relationships. Participants included *Tok Batin*, elders, committee representatives and village members from various OA subgroups. Names were coded, while role, subgroup and village location were retained.

Table 2: Profile of Orang Asli Interview Participants

Code	Roles in Village	Groups	Village Name and Location
PO01	Director, Cultural Institution	Mah Meri	Kampung OA Sungai Bumbun, Pulau Carey
PO02	OA Youth Representative	Mah Meri	Kampung OA Sungai Bumbun, Pulau Carey
PO03	Leader / <i>Tok Batin</i>	Jakun	Kampung OA Sungai Bot, Karak, Bentong
PO04	Village Chairperson	Temuan	Kampung OA Cinta Manis, Karak, Bentong
PO05	Leader / <i>Tok Batin</i>	Temuan	Kampung OA, Ulu Pareh, Karak, Bentong
PO06	OA Representative	Temuan	Kampung OA, Ulu Pareh, Karak, Bentong
PO07	Leader / <i>Tok Batin</i>	Jah Hut	Kampung OA Pian, Kuala Krau, Temerloh
PO08	OA Representative	Jah Hut	Kampung OA Pian, Kuala Krau, Temerloh
PO09	Leader / <i>Tok Batin</i>	Che Wong	Kampung Kuala Enggang, Temerloh
PO10	Village Elder	Che Wong	Kampung Kuala Enggang, Temerloh
PO11	OA Representative	Che Wong	Kampung Kuala Enggang, Temerloh
PO12	Leader / <i>Tok Batin</i>	Semelai	Kampung OA Pelawan, Pos Iskandar, Bera
PO13	OA Representative 1	Semelai	Kampung OA Pelawan, Pos Iskandar, Bera
PO14	OA Representative 2	Semelai	Kampung OA Pelawan, Pos Iskandar, Bera
PO15	OA Representative 3	Semelai	Kampung OA Pelawan, Pos Iskandar, Bera
PO16	Leader / <i>Tok Batin</i>	Bateq	Kampung OA Kuala Atok, Jerantut
PO17	Leader / <i>Tok Batin</i>	Semoq Beri	Kampung OA Sungai Tiang, Jerantut
PO18	Leader / <i>Tok Batin</i>	Semai	Kampung OA Rening, Cameron Highlands
PO19	Leader / <i>Tok Batin</i>	Semai	Kampung OA Kuala Boh, Cameron Highlands
PO20	Leader / <i>Tok Batin</i>	Jakun	Kampung OA Gumum, Tasik Chini, Pekan

Table 3: Coding Trail from Content Analysis to Theme Development

Coding Stage	Coding Output
1 Verbatim Transcription	PO08: ... <i>bila musim hujan panas, kita ambil daun hijau, mana-mana daun hijau pun boleh. Ludah sikit pada daun tu, letak dekat telinga supaya tak kena demam. Satu keluarga lah pakai daun pelindung...</i>
2 Transcript Excerpt	The participant explained that during alternating rainy and hot weather, green leaves are spat on and placed near the ear as a protective practice to prevent fever, with the practice observed by the whole family.
3 Condensed Meaning	Green leaves are used as protective botanical items to prevent fever during seasonal weather changes.
4 Initial Codes	Protective Leaf, Seasonal Fever Prevention, Botanical Protection
5 Final Code	Plant-Part Therapeutics
6 Facet	Materia Medica and Therapeutic Resources
7 Theme	Therapeutics, Healing and Foodways Knowledge

Document Analysis

Document analysis supported the interview data through a review of 403 academic, institutional, community and media sources on OA knowledge systems. Sources were selected for subgroup context, knowledge-based evidence and ICH Domain 4 relevance. Relevant content was condensed into meaning units and coded into manifestation codes, facets and themes for classifying ecological and cosmological knowledge heritage (refer to Table 4).

Table 4: Document Sources and Screening Criteria

No	Types	Sources	Inclusion Criteria	Exclusion Criteria
1	Peer Reviewed Articles	Mainly retrieved from MyCite, followed by Google Scholar, Scopus, ScienceDirect, JSTOR, DOAJ SpringerLink, Taylor & Francis Online	Evidence on OA ecological knowledge and wisdom, medicinal and foodways knowhow, celestial and cosmological knowledge, or subgroup context.	No ICH or OA knowledge evidence; focused only on development, education, health or socio-economy.
2	Conference Papers	Academic conference proceedings, seminar papers and heritage-related conference publications.	Relevant findings on OA ethnobotany and healing knowledge, subsistence practices, or knowledge transmission.	Too brief, duplicated published articles, or did not provide usable evidence for coding.
3	Book Chapters	Edited academic books on Orang Asli, indigenous studies, anthropology, heritage and culture.	Subgroup-specific evidence on ecological wisdom, celestial and cosmological knowledge.	General discussion without sufficient detail for coding.
4	Books and Monographs	Ethnographic books, cultural monographs, Orang Asli studies and indigenous community publications.	Detailed descriptions of OA ecological, healing, foodways ethnobotany, forest mobility, or cosmological knowledge.	Outdated claims without cultural relevance, unclear source basis or no link to knowledge.
5	Theses and Dissertations	University repositories, institutional libraries and postgraduate research databases.	Empirical or ethnographic findings on OA traditional ecological celestial and cosmological knowledge.	Unavailable full text, unrelated focus or no extractable cultural evidence.
6	Government Reports	Mainly JAKOA, with related government and agency reports.	Official information on OA subgroups, village context, and cultural programs.	Administrative data only, irrelevant to ICH documentation.
7	UNESCO documents	UNESCO ICH documents, safeguarding guidelines and conceptual references.	Definitions, safeguarding principles and conceptual guidance relevant to ICH knowledge and wisdom.	Unrelated to ICH concepts or documentation.
8	Museum Archives	Museum records, exhibition notes, archive descriptions and heritage documentation.	Descriptions of OA ecological lifeways objects, tools and materials with intangible meanings.	Records with unclear provenance and no identification of subgroups.
9	Community Publications	NGO materials, local publications, blogs, community websites and informal documentation.	Community accounts of forest and river practice and mobility, healing and foodways and resource use.	Unverifiable claims, or unidentifiable community context.
10	Media Recordings	Audio and video documentaries, online news articles, and media features related to Orang Asli communities.	Recorded or reported ecological knowledge, forest, river, healing and foodways knowledge and heritage transmission.	Sensationalized reporting, unclear informant source or insufficient detail for coding.

Multi-Phase Framework Development and Validation Workflow

Figures 1 and 2 map the framework development process across two stages, from source coding and thematic structuring to expert validation, refinement, restructuring, and final framework confirmation.

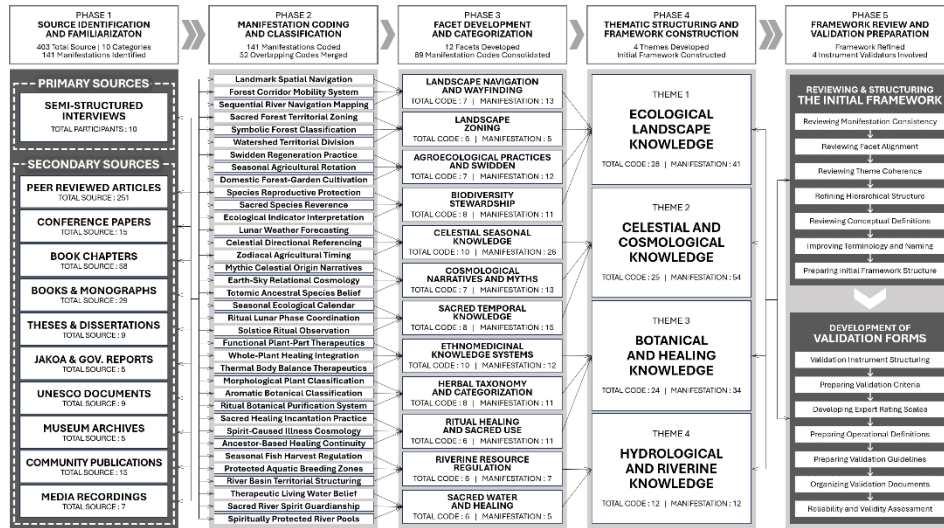


Figure 1: Initial Development and Construction of the ICH Domain 4 Framework

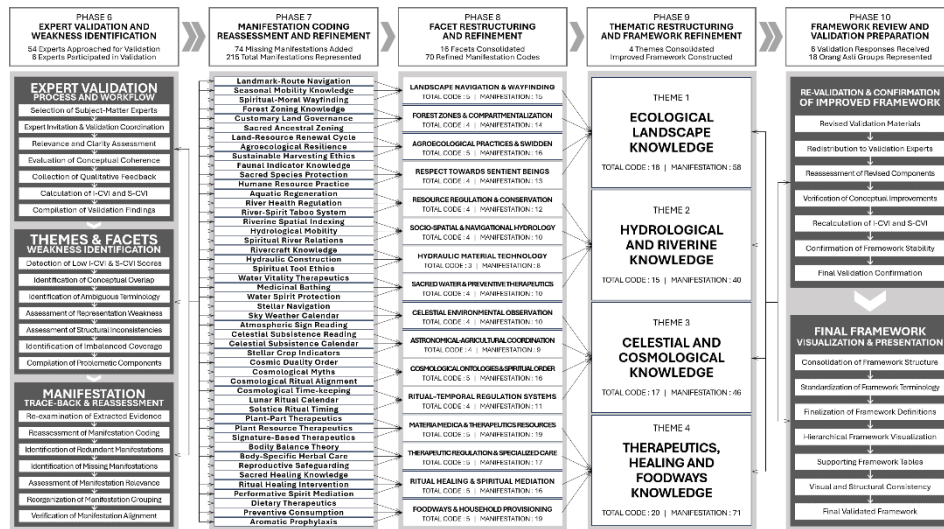


Figure 2: Expert Validation and Refinement of the ICH Domain 4 Framework

RESULTS

Six experts were involved in validating the framework. Their identities were protected through coded identifiers, listed as Expert 1 to Expert 6. Table 5 summarizes each expert's background, expertise, and feedback.

Table 5: Validators' Feedback and Corresponding Revisions

Validator	Feedback	Corresponding Revision
Expert 1 Department of Orang Asli Development (JAKOA) Expert in Indigenous welfare management and community support services	Suggested that Domain 4 manifestations give stronger attention to routes, directions, landmarks, and culturally meaningful places, as OA environmental knowledge is often stored through movement, place memory, and spatial experience.	<i>Landscape Navigation and Wayfinding</i> was retained and strengthened through landmark-route navigation, <i>Jok</i> mobility, and spiritual-moral wayfinding. River-based spatial knowledge was also expanded under Socio-Spatial and Navigational Hydrology through toponymic mapping, watershed zoning, flood navigation, and portage routes.
Expert 2 Department of Orang Asli Development (JAKOA) Expert in Indigenous welfare management and community support services	Recommended clarifying whether <i>Batek Jok</i> mobility and customary land are group-specific, as OA ecological knowledge, travel practices, and land relations vary across groups.	<i>Jok</i> mobility was positioned under <i>Landscape Navigation and Wayfinding</i> , and customary land knowledge was refined under <i>Forest Zones and Compartmentalization</i> . A 'Groups' column was added to specify relevant OA subgroups.
Expert 3 GERIMIS Art Project (Cultural Organization) Expert in Indigenous Knowledge, Cosmologies, and Eco-Critical Cultural Studies	Recommended more Domain 4-specific documentation, including relevant OA group, cultural context, indigenous terms, materials, celestial indicators, and belief meanings.	The revised manifestation tables include a 'Groups' column. Indigenous terms such as <i>Jok</i> , <i>Maganu Totuo</i> , <i>Tagal</i> , <i>Lubuk Larangan</i> , <i>Saka</i> , <i>Pancur</i> , <i>Celau</i> , <i>Penunggu</i> , <i>Jampi</i> , <i>Pantang</i> , and <i>Mai-Ten-Yul</i> were retained at manifestation level.
Expert 4 Institute of Environment and Development, Universiti Kebangsaan Malaysia Expert in Sustainable Livelihoods of Indigenous Communities, Heritage Conservation	Recommended clarifying the position of <i>Cosmological and Mythological Knowledge</i> within Domain 4, as cosmological worldviews may overlap with ecological knowledge.	<i>Celestial and Cosmological Knowledge</i> was reorganized into four clearer facets, distinguishing knowledge related to environmental prediction, subsistence timing, cosmological belief systems, and ritual calendars, reducing overlaps with ecological knowledge.
Expert 5 Faculty of Applied Social Sciences, Universiti Sultan Zainal Abidin Expert in Indigenous people studies, Social Anthropology	Suggested that customary rituals be considered as part of OA knowledge because they reflect respectful relations with nature, belief systems, and ecological ethics.	Ecological ritual and ethical resource-use knowledge were refined under <i>Ecological Landscape Knowledge</i> , particularly <i>Forest Zones and Compartmentalization</i> and <i>Respect Towards Sentient Beings</i> .
Expert 6 Kulliyyah of Sustainable Tourism and Contemporary Languages, International Islamic University Malaysia Expert in Humanities, Linguistic and Literature, Malay Language and Literature	Recommended clarifying overlapping classification terms, especially where ritual, healing, ecological, and cosmological knowledge intersect, so Domain 4 manifestations are classified by knowledge function rather than surface practice.	The revised framework classifies manifestations by knowledge function, expanding <i>Botanical and Healing Knowledge</i> into <i>Therapeutics</i> , <i>Healing and Foodways Knowledge</i> and refining hydrological knowledge through material technology, spatial navigation, and preventive therapeutics.

Table 6 presents the content validation summary for the initial framework, while Table 7 outlines the revised themes and facets.

Table 6: Content Validation Summary of the Initial Framework

Themes	I-CVI	Facets	I-CVI	S-CVI
Ecological Landscape Knowledge	0.83	Landscape Navigation and Wayfinding	1.00	0.92
		Landscape Zoning	0.83	
		Agroecological Practices and Swidden	1.00	
		Biodiversity Stewardship	0.83	
Celestial and Cosmological Knowledge	0.83	Celestial Seasonal Knowledge	1.00	0.89
		Cosmological Narratives and Myths	0.83	
		Sacred Temporal Knowledge	0.83	
Botanical and Healing Knowledge	0.83	Ethnomedicinal Knowledge System	0.83	0.89
		Herbal Taxonomy and Categorization	0.83	
		Ritual Healing and Sacred Use	1.00	
Hydrological and Riverine Knowledge	0.83	Riverine Resource Regulation	0.83	0.75
		Sacred Water and Healing	0.67	

Table 7: Revised Theme and Facets

Themes	Facets
Ecological Landscape Knowledge	Landscape Navigation and Wayfinding
	Forest Zones and Compartmentalization
	Agroecological Practices and Swidden
	Respect Towards Sentient Beings
Hydrological and Riverine Knowledge	Resource Regulation and Conservation
	Socio-Spatial and Navigational Hydrology
	Hydraulic Material Technology
	Sacred Water and Preventive Therapeutics
Celestial and Cosmological Knowledge	Celestial Environmental Observation
	Astronomical-Agricultural Coordination
	Cosmological Ontologies and Spiritual Orders
	Ritual–Temporal Regulation Systems
Therapeutics, Healing and Foodways Knowledge	Materia Medica and Therapeutics Resources
	Therapeutic Regulation and Specialized Care
	Ritual Healing and Spiritual Mediation
	Foodways and Household Provisioning

The initial framework showed acceptable agreement, but some facets still combined different types of knowledge within the same category. Ecological practice, riverine knowledge, cosmological belief, healing resources, and foodways needed clearer boundaries without losing their interconnections. The revised framework therefore separates ecological landscape knowledge, hydrological and riverine knowledge, celestial and cosmological knowledge, and therapeutics, healing and foodways knowledge. This gives clearer attention to spatial orientation, forest governance, swidden renewal, river regulation, hydraulic knowledge, celestial observation, ritual time, medicinal resources, and household provisioning. The final structure presents OA wisdom as a nature-culture system in which environmental practice, belief, resource use, healing, and everyday wellbeing remain closely connected.

Table 8: Revised Themes and Facets Definitions

Themes & Definitions	Facets & Definitions
Ecological Landscape Knowledge <i>A holistic environmental literacy system integrating spatial orientation, land governance, and sustainable subsistence with a moral worldview to ensure communal survival.</i>	Landscape Navigation and Wayfinding <i>The mental and physical systems used to organize spatial memory and navigate the landscape using environmental cues and traditional routes.</i>
	Forest Zones and Compartmentalization <i>The customary classification of terrestrial spaces into functional and symbolic regions to regulate resource access and safeguard territorial continuity.</i>
	Agroecological Practices and Swidden <i>The systematic management of soil, crops, and forest cycles that prioritizes long-term ecological health and subsistence sufficiency.</i>
	Respect Towards Sentient Beings <i>The ethical framework and behavioral protocols governing human interaction with non-human life to maintain the spiritual and biological forest hierarchy.</i>
Hydrological and Riverine Knowledge <i>A socio-technical and spiritual system governing the management, navigation, and therapeutic use of aquatic ecosystems.</i>	Riverine Resource Regulation and Conservation <i>The customary governance of aquatic life through ecological monitoring and social restrictions to ensure sustainable resource regeneration.</i>
	Socio-Spatial and Navigational Hydrology <i>The mental and physical mapping of river systems as primary anchors for territorial organization and seasonal mobility.</i>
	Hydraulic Material Technology <i>The applied engineering and craftsmanship used to manipulate water flow and construct specialized riverine tools and transport.</i>
	Sacred Water and Preventive Therapeutics <i>The spiritual and medicinal application of water from specific sources to restore vitality and maintain harmony with aquatic guardians.</i>
Celestial and Cosmological Knowledge <i>An integrated knowledge system that synchronizes human activities, agricultural cycles, and spiritual governance with celestial movements and mythic origins.</i>	Celestial Environmental Observation Systems <i>The systematic interpretation of atmospheric and stellar phenomena to provide predictive indicators for environmental change and navigational guidance.</i>
	Astronomical-Agricultural Coordination Systems <i>The practical application of celestial timing to regulate the production, harvesting, and management of food resources.</i>
	Cosmological Ontologies and Spiritual Orders <i>The foundational belief systems and mythic narratives that define the relationship between the cosmic realm and earthly existence.</i>
	Ritual-Temporal Regulation Systems <i>The management of communal time through sacred cycles and ceremonial markers to maintain synchronization with cosmic rhythms.</i>
Therapeutics, Healing and Foodways Knowledge <i>A holistic knowledge system integrating natural resources, bodily care, food practices, and spiritual mediation to sustain health and community wellbeing.</i>	Materia Medica and Therapeutics Resources <i>The specialized knowledge regarding the properties and preparation of natural substances into complex healing agents.</i>
	Therapeutic Regulation and Specialized Care <i>The application of indigenous physiological theories to provide targeted medical interventions across diverse life stages and social roles.</i>
	Ritual Healing and Spiritual Mediation <i>The sacred dimension of healing involving metaphysical diagnosis and ceremonial practices to resolve the spiritual root causes of affliction.</i>
	Foodways and Household Provisioning <i>The inherited knowledge of food selection, preparation, preservation, and household provisioning for sustenance and everyday wellbeing.</i>

Tables 9–12 organise the ICH manifestations into a thematic framework. The examples shown provide partial representation only, since each theme comprises four facets, each facet contains three to five codes, and each code may include various manifestations.

Table 9: Theme 1 – Ecological Landscape Knowledge

Facets	Codes	Examples of Manifestation	Groups
Landscape Navigation and Way-finding	Landmark-Route	Natural Feature Mapping: Natural landmarks (ridges, trees, river bends, etc.) cognitively structure landscape memory.	ALL
	Navigation	Jok Mobility: Customary forest route through forest corridors shaped by inherited ecological experience and familiarity.	Bat/Jai/Men/Ken
	Seasonal Mobility	Seasonal Ecological Naming: Classification of temporal cycles structured around ecological and climatic transitions.	Bat/Sem/Ter/Tem
	Knowledge	Migration Tracking: Animal migration patterns and ecological cues are interpreted for seasonal mobility planning.	Bat/Sem/Ter/Jat
	Spiritual-Moral	Spiritual Path: Forest pathways are distinguished between permissible and restricted routes through spiritual meanings.	ALL
	Wayfinding	Moral Orientation: Spatial movement requires ethical mindfulness of unseen forces disrupting ecological harmony.	ALL
Forest Zones and Compart-ment-ization	Forest Zoning	Forest Classification: Classificatory system of forest landscapes via symbolic, ecological, or functional distinctions.	Bat/Sem/Ter/Che
	Knowledge	Fallow Land Regeneration: Reclassification of forest areas from active cultivation to regenerative phase to restore fertility.	Sem/Ter/Tem/Jak
	Customary Land Governance	Communal Land Governance: Management of forest access through customary rules to prevent resource overuse or conflict.	Sem/Tem/Jak/Sel
		Land Encroachment: Engagement with external actors to negotiate forest boundaries and defend customary territories.	ALL
	Sacred Ancestral Zoning	Sacred Forest Zoning: Specific forest areas are spiritually inhabited and sacred; hence approached with moral discipline.	ALL
		Ancestral Territory: Forest boundaries are morally inherited through ancestral links and spiritual territorial belonging.	Sem/Tem/Jak/Sel
Agro-ecological Practices and Swidden	Land-Resource Renewal Cycle	Seasonal Rotation: Forest productivity, crop maturity, and soil recovery are managed through seasonal ecological cycles.	Sem/Ter/Tem/Jak
		Land-Human Lifecycle Parallelism: The belief that human life and land regeneration follow parallel cyclical rhythms.	Sem/Ter/Bat/Jai
	Agroeco-logical Resilience	Crop Diversity: Systematic diversification of crop species for food security, soil stability, and pest and climatic resilience.	Sem/Tem/Jak/Jat
		Domestic Agroforestry: Home gardens mirror forest structure through multi-layered vegetation for food and medicinal use.	Tem/Jak/Sem/Mah
	Sustainable Harvesting Ethics	Maganu Totuo: Crops and forest resources are harvested according to species maturity and reproductive stage.	ALL
		Subsistence Principle: Subsistence ethics prioritize cultivating sufficient for rather than over accumulating surplus.	ALL
Respect Towards Sentient Beings	Faunal Indicator Knowledge	Avian Seasonal Transition: Bird presence signals ecological transition, climatic change, and ecosystem health.	Bat/Sem/Ter/Jat
		Faunal Regulation: Long-term observation of species-specific habits and reproductive timing to avoid disrupting regeneration.	ALL
	Sacred Species Protection	Totemic Species Reverence: Certain species embody ancestral spirits and require reverent, morally guided treatment.	ALL
		Dragonfly Catching Taboo: Dragonflies are spiritually linked to ecological balance; hence harming them is tabooed.	Sem/Ter/Che/Seq
	Humane Resource Practice	Sumpitan: Close-range precision, quick and quiet practice using a blowpipe and plant-based darts to avoid sufferings.	Bat/Jat
		Botanical Pest Stewardship: Plant-based pest control protects crops while reducing harm to sentient life.	Sem/Tem/Jak/Jat

Note. ALL = All or almost all ethnic groups practiced the manifestation; Abbreviations refer to Orang Asli subgroups: Kensiu (Ken), Kintaq (Kiq), Jahai (Jai), Mendriq (Men), Bateq (Bat), Temiar (Ter), Semai (Sem), Jah Hut (Jat), Che Wong (Che), Semoq Beri (Seq), Mah Meri (Mah), Temuan (Tem), Jakun (Jak), Semelai (Sel), Orang Kuala (Orl), Orang Seletar (Ors), and Orang Kanaq (Ork).

Table 10: Theme 2 – Hydrological and Riverine Knowledge

Facets	Codes	Examples of Manifestation	Groups
Riverine Resource Regulation and Conservation	Aquatic Regeneration	Spawning Cycles (<i>Tagal</i>): Fish breeding seasons are observed to regulate harvesting and ensure population regeneration.	Sem/Tem/Jak/Bat
		Lubuk Larangan: The communal practice of declaring specific deep river pools off-limits to fishing to preserve breeding stock.	Sem/Tem/Jak/Bat
	River Health Regulation	Aquatic Health Indicators: Moss density, water clarity, and other environmental markers indicate river ecosystem health.	Bat/Jai/Sem/Tem
		Downstream Etiquette: Bathing and waste disposal are regulated to keep water clean for downstream communities.	Che/Jat/Sem/Ter
	River-Spirit Taboo System	Covenant with Crocodile: Crocodiles are believed to protect rivers when humans respect specific fishing taboos.	Sel/Jak
		The Noise Taboo (<i>Celau</i>): Excessive noise or mockery near water triggers supernatural storms and dangerous flash flooding	ALL
Socio-Spatial and Navigational Hydrology	Riverine Spatial Indexing	Toponymic Mapping: Sequential river names and narratives form a mental spatial index (river spine) for forest navigation.	ALL
		Watershed Zoning: The division of ancestral forest territories based on the natural drainage areas of river tributaries (<i>Saka</i>).	Sem/Ter/Jak/Tem
	Hydrological Mobility	Flood Cycle Navigation: Seasonal flood patterns guide safe transport, river crossing, and resource collection.	Jak/Sel/Tem/Sem
		Portage Route: Forest corridors connecting river basins are identified and maintained for trade and resource movement.	Sel/Jak/Tem/Mah
	Spiritual River Relations	Ancestral Presence in Pools: Ancient deep river pools are understood as dwelling places of protective ancestral spirits.	Sel/Jak/Tem/Jat
		River-Soul Connection: An individual's life-force is spiritually linked to the health and flow of their birth river.	Ter/Sem/Bat/Jai
Hydraulic Material Technology	Rivercraft Knowledge	Hydro-Acoustic Knowledge: Interpretation of water sounds to identify hidden rocks, depth changes or fish-breeding grounds.	Jak/Sel/Ors/Tem
		Riparian Buoyancy: Expertise in lightweight, water-resistant timbers for constructing durable and balanced dugout canoes.	Orl/Ors/Jak/Sel
	Hydraulic Construction	Bamboo Aqueduct (<i>Pancur</i>): Engineering practice of gravity-fed split bamboo water systems to supply water to villages.	Sem/Ter/Jat/Che
		Empang Construction: Temporary construction of river weir using stones and rattan to channel fish into traditional traps.	Jat/Sem/Jak
	Spiritual Tool Ethics	Tool-Spirit Respect: River tools (boats, traps, etc) possess spirits that require respectful treatment for successful use.	Sel/Jak/Orl/Tem
		Material Sanctity: Bamboo for water transport must be harvested during specific lunar phases to ensure spiritual purity.	Tem/Sem/Jak/Jat
Sacred Water and Preventive Therapeutics	Water Vitality Therapeutics	Thermal Healing: Knowledge of specific mineral and spiritual properties of hot springs to treat skin and joint ailments.	Sem/Tem/Jak/Jat
		Water Vitality: Running river water is believed to carry cool energy that neutralizes the heat of physical illness.	Ter/Sem/Bat/Che
	Medicinal Bathing	Aquatic Pharmacopeia: Water-dwelling plants and roots harvested for essential ingredients in medicinal healing baths.	Jak/Tem/Sel/Sem
		Ritual Lustration: The ceremonial bathing in purified or floral water to restore spiritual harmony and wash away misfortune.	ALL
	Water Spirit Protection	Spirit Offering: Ritual offerings placed at river confluences or lakes for protection, safe passage, and successful foraging.	Sel/Mah/Jak/Tem
		Spring Guardianship: Every freshwater spring is protected by a spiritual guardian (<i>Penunggu</i>) who grant permission for use.	Che/Bat/Jai/Men

Note. ALL = All or almost all ethnic groups practiced the manifestation; Abbreviations refer to Orang Asli subgroups: Kensiu (Ken), Kintaq (Kiq), Jahai (Jai), Mendriq (Men), Bateq (Bat), Temiar (Ter), Semai (Sem), Jah Hut (Jat), Che Wong (Che), Semoq Beri (Seq), Mah Meri (Mah), Temuan (Tem), Jakun (Jak), Semelai (Sel), Orang Kuala (Orl), Orang Seletar (Ors), and Orang Kanaq (Ork).

Table 11: Theme 3 – Celestial and Cosmological Knowledge

Facets	Codes	Examples of Manifestation	Groups
Celestial Environmental Observation Systems	Stellar Navigation	Biduk Navigation: Stellar patterns are used to guide movement and migration decisions according to climatic conditions.	Sel/Jak/Tem/Orl
		Balatek Navigation: Celestial reference guide directional movement across landscapes and changing seasonal conditions.	Sem/Ter/Bat/Jat
	Sky Weather Calendar	Bapak Langit Calendar: Sky signs as timing - cloud colour, rainbow arcs, and wind signs for coming rains or droughts.	ALL
		Lunar Halo Weather Indicator: Lunar rings are recognized as atmospheric signs indicating possible impending rainfall.	ALL
	Atmospheric Sign Reading	Sky Colour Interpretation: Atmospheric colour shifts are read to identify seasonal transitions and environmental changes.	ALL
		Wind-Spirit Movement: Wind pattern changes are understood as signs of spiritual presence and movement.	ALL
Astronomical Agricultural Coordination Systems	Celestial Subsistence Reading	Celestial Indicators: The reading of celestial signs to recognize seasonal onset (begin/shift) or environmental change	ALL
		Stellar Subsistence: Star patterns guide agricultural, hunting, and seasonal subsistence decisions.	Sem/Ter/Bat/Jai
	Celestial Subsistence Calendar	Lunar-Guided Planting: Planting activities are coordinated according to waxing and waning lunar phases.	Sem/Ter/Tem/Jak
		Celestial Food Management: Food storage and consumption are actively regulated according to celestial-seasonal timing.	Sem/Ter/Jak/Sel
	Stellar Crop Indicators	Periantan Penungguyan: Peyh, Jekat, and Keranchong constellations signal the paddy waiting or guiding season.	Sem/Ter/Tem/Jat
		Lunga and Lerek: Lunga (Pleiades) signals fruit loosening, while Lerek (Orion's Belt) signals fruits ripening in March.	Bat/Jai/Sem/Ter
Cosmological Ontologies and Spiritual Orders	Cosmic Duality Order	Celestial Duality: A systemic understanding of celestial bodies as complementary opposites that maintain universal balance.	ALL
		Earth–Sky Dualism: Earth and sky are conceptualized as interdependent realms shaping existence, relations, and order.	ALL
	Cosmological Myths	Cosmological Folklore: Sun, moon, and star narratives transmit cosmological worldview, social and ecological ethics.	ALL
		Sura Alam Mythology: Cosmic-origin myths connect celestial beings with earthly fertility and cosmological order.	Sem/Ter/Tem/Jak
	Cosmological Ritual Alignment	Trance-Dance Rituals: Trance performances are understood to align communal spiritual states with seasonal rhythms.	Ter/Sem/Bat/Jai
		Animal-Mimetic Rituals: Subsistence rituals interpret animal behaviours as signs of celestial timing and life-cycle processes.	ALL
Ritual-Temporal Regulation Systems	Cosmological Time-keeping	Lunisolar Timekeeping: Long-term timekeeping system integrates solar positions and lunar cycles for temporal tracking.	Sem/Ter/Tem/Sel
		Zodiac Year Cycle System: Zodiacal yearly cycles provide a temporal structure for ritual timing and seasonal planning.	Tem/Jak/Sel/Mah
	Lunar Ritual Calendar	Five-Day Ritual Calendar: Crescent moon marks new cycle of planting while full moon linked to fertility rituals.	Bat/Jai/Sem/Ter
		Moon-Phase Timing: Twelve-month lunar cycle knowledge is used to calculate timing for communal rituals.	ALL
	Solstice Ritual Timing	Hari Moyang Solstice Ritual: Solstice-timed ritual observance marks ancestral remembrance and ceremonial order.	Mah/Tem/Jak/Sel
		Hari Genggulang Solstice Ritual: Community ceremony follows solstice-based timing to regulate sacred temporality.	Sem/Ter/Jat/Che

Note. ALL = All or almost all ethnic groups practiced the manifestation; Abbreviations refer to Orang Asli subgroups: Kensiu (Ken), Kintaq (Kiq), Jahai (Jai), Mendriq (Men), Bateq (Bat), Temiar (Ter), Semai (Sem), Jah Hut (Jat), Che Wong (Che), Semoq Beri (Seq), Mah Meri (Mah), Temuan (Tem), Jakun (Jak), Semelai (Sel), Orang Kuala (Orl), Orang Seletar (Ors), and Orang Kanaq (Ork).

Table 12: Theme 4 – Therapeutics, Healing and Foodways Knowledge

Facets	Codes	Examples of Manifestation	Groups
Materia Medica and Therapeutics Resources	Plant-Part Therapeutics	Multi-Part Plant: Knowledge of different plant parts and their specific therapeutic use for particular ailments.	ALL
		Plant-Part Use: Roots, bark, leaves, fruits, seeds, resin, and latex are prepared separately for specific illness treatments.	ALL
	Plant Resource Therapeutics	Localized Bamboo: Ethnobotanical and community-specific bamboo knowledge for restorative and health-related uses.	Sem/Ter/Jat/Che
		Whole-Plant Use: Entire plants gathered and used as integrated healing substances for stamina, strength, and wellbeing.	Bat/Jai/Men/Ken
	Signature-Based Therapeutics	Plant Signatures: Morphological mimicry (shape and colour) dictate that leaves and roots regulate bodily heat and balance.	ALL
Therapeutic Regulation and Specialized Care		Animal Signatures: Vitality mimicry (behaviour) dictate that bones and bezoars restore strength and specialized immunity.	Sem/Tem/Jak/Bat
	Bodily Balance Theory	Theory of Hot vs. Cold: Health depends on balancing bodily hot and cold states through botanical and dietary treatment.	ALL
		Theory of <i>Bayik</i>: Pain is ‘trapped wind’ or ‘stagnant breath’, needing massage (<i>urut</i>) and wind-expelling botanicals.	Sem/Ter/Tem/Jak
	Body-Specific Herbal Care	Gender-Specific Herbs: Herbal resources and treatments are prepared according to gendered bodily needs and social roles.	Sem/Tem/Jak/Mah
		Age-Specific Herbs: Gentle herbal treatments are prepared according to childhood illnesses and age-specific bodily needs.	ALL
Ritual Healing and Spiritual Mediation	Reproductive Safe-guarding	<i>Pantang</i>: Postnatal restrictions protect ‘porous’ (vulnerable) mothers from forest spirits, omens, and harmful exposure.	ALL
		<i>Mai-Ten-Yul</i>: A state of spiritual entanglement where the unborn child (<i>Yul</i>) follows (<i>Ten</i>) the parents’ (<i>Mai</i>) movement.	Ter/Sem/Che/Jat
	Sacred Healing Knowledge	<i>Jampi</i>: Hereditary verbal healing knowledge uses sacred recitations to invoke protective and restorative power.	ALL
		Spiritual Diagnosis: Illness is understood as disorder caused by spirit entities, taboos, or soul displacement.	ALL
	Ritual Healing Intervention	Ritual Offering: Offerings are presented to spirits to seek protection, restore harmony, and support spiritual intervention.	ALL
Foodways and Household Provisioning		Ritual Scent: Aromatic botanicals purify ritual space, strengthen sacred efficacy, and support healing processes.	Sem/Ter/Tem/Sel
	Performative Spirit Mediation	Healing Chant and Percussion: Vocal and spiritually rhythmic performances invoke healing and spiritual assistance.	Ter/Sem/Bat/Jai
		Ancestor Veneration Ritual: Healing continuity is believed to be sustained through ceremonial relations with ancestors.	Mah/Tem/Jak/Sel
	Dietary Therapeutics	Nutraceutical Selection: Species-selected wild-harvested foods are as blood cleansers or digestive aids in daily diet.	ALL
		Bitter-Tonic Blood Cleansing: Foraged bitter plants are added to household meals as daily systemic tonics to purify blood.	ALL
	Preventive Consumption	Seasonal Prevention: Specific roots or tubers that must be consumed during seasonal changes to strengthen immunity.	Bat/Sem/Ter/Tem
		Avoidance of <i>Kempunan</i>: Provisioned foods are shared or tasted communally to prevent vulnerability and illness.	ALL
		Prophylactic Smudging: <i>Kemenyan</i> or aromatic botanicals are burned to repel insects and illness-causing miasmas.	Sem/Ter/Tem/Jak
	Aromatic Prophylaxis	Aromatic Prophylaxis: Pungent plants are worn or hung around the house to block sickness-bearing spirits.	ALL

Note. ALL = All or almost all ethnic groups practiced the manifestation; Abbreviations refer to Orang Asli subgroups: Kensiu (Ken), Kintaq (Kiq), Jahai (Jai), Mendriq (Men), Bateq (Bat), Temiar (Ter), Semai (Sem), Jah Hut (Jat), Che Wong (Che), Semoq Beri (Seq), Mah Meri (Mah), Temuan (Tem), Jakun (Jak), Semelai (Sel), Orang Kuala (Orl), Orang Seletar (Ors), and Orang Kanaq (Ork).

The shift from Tables 9–12 to Table 13 is based on the environmental settings through which OA knowledge is practiced and sustained. Table 9 shows ecological knowledge moving through landmarks, Jok routes, forest zones, customary territories, swidden areas, sacred species habitats and harvesting sites. These codes indicate spaces of mobility, governance, renewal and species stewardship. Table 10 adds the riverine dimension, where spawning pools, *lubuk larangan*, watershed divisions, flood routes, portage paths, aqueducts, boats, springs and bathing places become part of hydrological memory and water-based practice. Table 11 introduces celestial and cosmological settings through sky observation, stellar navigation, lunar timing, agricultural calendars, ritual cycles and cosmological order. Table 12 grounds therapeutic and foodway knowledge in medicinal collection areas, healing settings, ritual treatment spaces, household storage, food sharing and preventive consumption.

Table 13 translates these knowledge settings into five layers of cultural spaces: place memory and forest governance, ecological renewal and species stewardship, riverine systems and water heritage, celestial timing and cosmological order, and healing resource and household wellbeing. The ten cultural spaces were therefore drawn from how the manifestation codes relate to land, rivers, species, sky, healing resources and household practice. Table 14 applies these spaces to each code, allowing the framework to support customary landscape mapping, conservation zoning, river corridor protection, sacred water management, medicinal resource safeguarding and culturally sensitive development control.

Table 13: Planning-Oriented Cultural Space Framework

Layers	Code	Cultural Spaces	Definition
Place Memory and Forest Governance	A	Landmark-Route Memory Corridor	Corridors linking landmarks, forest paths, mobility routes, and wayfinding memory.
	B	Customary Forest Territory Area	Forest areas governed by customary access, ancestral claims, and territorial restrictions.
Ecological Renewal and Species Stewardship	C	Swidden Agroforestry Renewal Landscape	Cultivation landscapes sustaining fallow cycles, crop diversity, harvesting, and regeneration.
	D	Sentient Species Habitat Area	Habitats sustaining animal indicators, sacred species, taboos, and ethical restraint.
Riverine Systems and Water Heritage	E	River Corridor and Pool Network	River networks linking tributaries, pools, watersheds, crossings, and mobility routes.
	F	Sacred Water and Hydraulic Site	Water sites for springs, bathing, aqueducts, weirs, boats, and technologies.
Celestial Timing and Cosmological Order	G	Celestial Observation Ground	Open grounds for sky observation, weather reading, navigation, and timing.
	H	Cosmological Ritual Timing Site	Ritual sites structured by cosmological belief, sacred temporality, and ceremonial calendars.
Healing Resource and Household Wellbeing	I	Medicinal Resource and Healing Area	Resource areas for medicinal collection, preparation, treatment, and ritual healing.
	J	Foodway Provisioning Household Setting	Household settings supporting food selection, storage, sharing, and preventive protection.

Table 14: Spatial Interpretation of ICH Manifestation Codes

Themes	Facets	Manifestation Codes	Cultural Spaces (Coded)									
			A	B	C	D	E	F	G	H	I	J
Ecological Landscape Knowledge	Landscape	Landmark-Route Navigation	/									
	Navigation & Wayfinding	Seasonal Mobility Knowledge	/			/						
		Spiritual-Moral Wayfinding	/	/								
	Forest Zones & Compartmentalization	Forest Zoning Knowledge		/	/							
		Customary Land Governance		/								
		Sacred Ancestral Zoning		/						/		
	Agroecological Practices & Swidden	Land-Resource Renewal Cycle			/					/		
		Agroecological Resilience			/						/	/
		Sustainable Harvesting Ethics			/							/
	Respect tow. Sentient Beings	Faunal Indicator Knowledge				/						
Hydrological and Riverine Knowledge		Sacred Species Protection				/				/		
		Humane Resource Practice			/	/						
	Riverine Resource Reg. & Conserv.	Aquatic Regeneration				/	/					
		River Health Regulation					/					
		River-Spirit Taboo System				/	/			/		
	Socio-Spatial & Navigational Hydrology	Riverine Spatial Indexing	/	/			/					
		Hydrological Mobility	/				/					
		Spiritual River Relations				/				/		
	Hydraulic Material Technology	Rivercraft Knowledge					/	/				
		Hydraulic Construction					/	/				
Celestial and Cosmological Knowledge		Spiritual Tool Ethics						/		/		
	Sacred Water & Preventive Therapeutics	Water Vitality Therapeutics					/			/		
		Medicinal Bathing						/			/	
		Water Spirit Protection				/	/			/		
	Celestial Env. Observation Systems	Stellar Navigation	/						/			
		Sky Weather Calendar							/			
		Atmospheric Sign Reading						/	/			
	Astronomical-Agricultural Coord. Syst.	Celestial Subsistence Reading			/			/				
		Celestial Subsistence Calendar			/			/			/	
		Stellar Crop Indicators			/			/				
Therapeutics, Healing and Foodways Knowledge	Cosmological Ontologies & Spiritual Ord.	Cosmic Duality Order								/		
		Cosmological Myths			/					/		
		Cosmological Ritual Alignment			/			/	/	/		
	Ritual-Temporal Reg. System	Cosmological Timekeeping						/	/	/		
		Lunar Ritual Calendar			/			/	/	/		
		Solstice Ritual Timing						/	/	/		
	Materia Med. & Therapeutics Resources	Plant-Part Therapeutics								/		
		Plant Resource Therapeutics								/		
		Signature-Based Therapeutics			/					/		
	Therapeutic Regulation & Spec. Care	Bodily Balance Theory								/	/	/
Foodways Knowledge		Body-Specific Herbal Care								/		
		Reproductive Safeguarding							/	/	/	/
	Ritual Healing & Spiritual Mediation	Sacred Healing Knowledge						/	/	/		
		Ritual Healing Intervention						/	/	/		
		Performative Spirit Mediation						/	/	/		
	Foodways & Household Provisioning	Dietary Therapeutics								/	/	/
		Preventive Consumption								/	/	/
		Aromatic Prophylaxis							/	/	/	/

DISCUSSION

The validation results indicate a sound initial structure, with theme-level I-CVI values of 0.83 and S-CVI values ranging from 0.75 to 0.92. Nevertheless, expert feedback identified areas requiring sharper functional separation, particularly where ecological, cosmological, hydrological and healing knowledge intersected. The revised framework distinguishes four knowledge systems: (i) Ecological Landscape Knowledge, (ii) Hydrological and Riverine Knowledge, (iii) Celestial and Cosmological Knowledge, and (iv) Therapeutics, Healing and Foodways Knowledge. This structure clarifies how OA knowledge and wisdom operate through navigation, forest governance, resource renewal, water management, celestial timing, healing practice and household provisioning.

The results further show that such knowledge and wisdom are inseparable from environmental settings. Landmarks, *Jok* routes, customary territories, swidden areas, species habitats, rivers, pools, springs, observation grounds, medicinal collection areas and household spaces function as places of learning, regulation and practice. Tables 13 and 14 translate these relationships into five heritage-mapping layers and ten cultural spaces.

This spatial reading strengthens the planning relevance of the framework. The framework informs customary landscape mapping, conservation zoning, river-corridor protection, sacred-water management, medicinal-resource safeguarding and development control. Rather than treating ecosystems as neutral backgrounds, the framework recognizes them as active cultural spaces where ecological knowledge, belief, technology and wellbeing are sustained. Application should therefore be community-led and sensitive to customary access, seasonal use and restricted knowledge.

CONCLUSION

This study is positioned within continuing work to document and structure OA ICH, addressing specifically Domain 45, Knowledge and Practices, concerning nature and the universe. The findings show that knowledge encapsulates what is known, applied, observed, managed, and transmitted as practical expertise. The study proposed an expert-informed framework that divides OA knowledge and wisdom into four themes, sixteen facets, and matching manifestation codes. This structure clarifies OA knowledge across ecology and landscape, hydrology and waterways, celestial and cosmology, and therapeutics and foodways. The key contribution lies in converting these knowledge systems into spatial planning categories. Forest routes, customary lands, river networks, swidden landscapes, and species habitats form a culturally structured environment. Realizing this spatial attribution strengthens heritage inventories and community-based documentation. The framework establishes a conceptual starting point for cultural spaces, rather than a final spatial inventory. Future site-specific mapping should be improved through sustained OA community input and validation.

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