Tacit Knowledge Management of Fisherfolk in Developing Countries: Designing a Framework from the Sustainability Perspective

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Abstract

Fisherfolk communities possess tacit knowledge that supports ecological decision-making, livelihoods, cultural continuity, and adaptation, yet this knowledge is increasingly vulnerable as intergenerational learning is disrupted by youth migration, changing livelihood aspirations, environmental change, and unequal access to technology. This study examines how fisherfolk in Bangladesh and Indonesia preserve, share, and adapt tacit knowledge and develops a sustainability-oriented Tacit Knowledge Management Framework grounded in their experiences. A comparative qualitative design was employed, comprising 16 focus group discussions across two locations in Bangladesh and three in Indonesia, alongside 20 key informant interviews with stakeholders working with fishing communities. Data were analyzed thematically through open coding, cross-country comparison, and examination of relationships among ecological, social, cultural, economic, institutional, and technological dimensions. Findings show that fisherfolk knowledge is an interconnected system encompassing ecological understanding, fishing expertise, livelihood practices, and gendered knowledge. Its continuity depends primarily on experiential and intergenerational learning, mentorship, storytelling, collective activities, rituals, and community interaction rather than formal storage. However, declining youth participation, changing environmental and livelihood conditions, and dependence on oral and demonstration-based transmission create vulnerabilities. Participants viewed digital archives, mobile applications, videos, and local media as useful complements, but not substitutes, for experiential learning. Building on these findings, the proposed framework positions community-based preservation and sharing practices at its core, with accessible documentation and digital technologies providing complementary support. The study extends tacit knowledge management beyond organizational

settings by conceptualizing knowledge as embedded within dynamic social-ecological and livelihood relationships, offering a pathway for sustaining knowledge continuity and adaptive capacity.

Keywords
Tacit knowledge; Fisherfolk; Bangladesh; Indonesia; Sustainability

1. Introduction

People whose livelihoods depend primarily on fishing are fisherfolk. In developing countries, small-scale fisherfolk rely heavily on rivers, lakes, and coastal ecosystems for livelihoods and well-being (Johannes et al., 2000; Knudsen, 2008; Berkes, 2009). Through generations of interaction, they have developed experiential knowledge for interpreting ecological change, predicting weather, navigating waterways, managing resources, and sustaining livelihoods (Wilson et al., 2006; Knudsen, 2008; Léopold et al., 2014; Santha, 2008). Much of this knowledge is tacit rather than codified. Polanyi (1966, p. 4) conceptualized knowledge on a continuum from tacit, embodied knowledge to explicit, codified knowledge. In fishing communities, knowledge is embedded in intuition, skills, observation, and lived experience (Kanij et al., 2023) and transmitted through observation, apprenticeship, storytelling, and participation. It supports adaptation to environmental and socio-economic uncertainty (Folke et al., 2002; Berkes, 2009; Yamin et al., 2025; Susilo et al., 2021) and sustainable social-ecological systems (Folke et al., 2002; Zetina-Rejón et al., 2022).

Local ecological knowledge supports conservation, adaptive governance, ecosystem stewardship, and resilience (Ostrom, 1990; Folke et al., 2002; Berkes, 2009), evolving through observation, experimentation, and social learning (Berkes, 2009; Berkes et al., 2000). Fisherfolk possess knowledge of fishing locations, seasonal timing, gear, navigation, weather, and habitat protection (Knudsen, 2008; Léopold et al., 2014; Johannessen, 2022). Acquired through apprenticeship, observation, ritual, storytelling, and participation, this knowledge is contextual and difficult to codify (Kanij et al., 2023; Johannessen, 2022) and reflects social, cultural, and economic relationships with the environment (Berkes, 2009; Pretty et al., 2009).

Yet fisherfolk's tacit knowledge is increasingly vulnerable. Informal, subsistence-based fishing has rarely prioritized systematic preservation (Jütting & de Laiglesia, 2009), while declining returns, environmental uncertainty, youth migration, and changing aspirations weaken intergenerational learning (Kanij et al., 2023; Miah & Islam, 2020). Climate change, overfishing, environmental degradation, market pressures, and technological transformation further reshape traditional fishing systems (Pauly et al., 1998; Ullah et al., 2024; Kelling et al., 2026), threatening ecological knowledge developed over generations.

These challenges are evident in Bangladesh and Indonesia. In Bangladesh, 10-12% of the population depends directly or indirectly on fisheries (Mahmud et al., 2015; Tran

et al., 2023), while fisherfolk face poverty, educational and information inequality, weak institutional support, and disaster exposure (Das et al., 2015; Hossain et al., 2009; Shuva, 2017; Miah & Islam, 2020). Indonesian fishing communities similarly experience marginalization, environmental degradation, fluctuating incomes, and limited access to information and public services (Irhandayaningsih, 2020; Prasetyo et al., 2023; Supriati & Umar, 2020). In both countries, fisherfolk rely on local ecological knowledge for fishing, environmental interpretation, and cultural continuity.

Existing research documents fisherfolk's local ecological knowledge, including fishing techniques, environmental observations, indigenous resource management, and traditional ecological understanding (Johannes et al., 2000; Wilson et al., 2006; Knudsen, 2008; Santha, 2008; Léopold et al., 2014). Tacit knowledge management research, largely organizational, examines capturing, codifying, and sharing experiential knowledge (Clarke, 2010; Nonaka, 2009; Chen & Nunes, 2019). Few studies connect these bodies of scholarship to examine tacit knowledge as a sustainability resource or conceptualize ecological knowledge, socio-cultural practices, and livelihoods as interconnected social-ecological systems. Knowledge preservation cannot be reduced to documentation because knowledge is socially produced, validated, and transmitted through relationships among communities, institutions, and environments (Jasanoff, 2004; Ijatuyi et al., 2025). Knowledge management should therefore preserve the relationships, practices, and institutional arrangements through which knowledge is recreated (Von Krogh et al., 2000; Wiig, 2007), while digital technologies should complement rather than replace storytelling, apprenticeship, mentorship, and collective learning (Khan & Gope, 2025; Liguori et al., 2025).

Drawing on tacit knowledge management (Polanyi, 1966; Nonaka, 2009; Clarke, 2010; Chen & Nunes, 2019), local ecological knowledge (Berkes, 2009), and social-ecological sustainability (Folke et al., 2002), this study examines tacit knowledge preservation, sharing, and adaptation in Bangladesh and Indonesia. Sustainability provides an analytical lens linking ecological knowledge, socio-cultural practices, and livelihoods to adaptive capacity, resilience, and sustainable livelihoods.

We employed a qualitative design comprising focus group discussions (FGDs) with fisherfolk and semi-structured interviews with key stakeholders in Bangladesh and Indonesia. The comparative design examined knowledge practices, transmission, threats to continuity, and expectations for preservation.

The study makes three contributions: empirically, comparative evidence on fisherfolk tacit knowledge in Bangladesh and Indonesia; theoretically, extending tacit knowledge management beyond organizational settings by conceptualizing fisherfolk knowledge as a social-ecological system supporting ecological sustainability, social cohesion, and livelihood resilience; and practically, a sustainability-oriented Tacit Knowledge Management Framework integrating traditional sharing practices with culturally appropriate digital mechanisms for preservation and intergenerational

transfer. The research addresses three questions:

RQ1 What forms of tacit knowledge do fisherfolk communities in developing countries possess from a sustainability perspective?

RQ2 How is tacit knowledge currently preserved and shared within fisherfolk communities?

RQ3 What challenges and expectations shape the future preservation and sharing of tacit knowledge among fisherfolk in developing countries?

2. Literature review

2.1. Tacit Knowledge Management Beyond Organizational Settings

Tacit knowledge is one of the most valuable yet difficult forms of knowledge to manage because it resides in people's experiences, actions, beliefs, and social interactions rather than documents or formal procedures (Polanyi, 1966). Unlike explicit knowledge, which can be readily codified and transferred, tacit knowledge is embedded in practice and expressed through intuition, observation, embodied skills, and contextual judgement. Polanyi's (1966) assertion that "we know more than we can tell" captures the challenge of preserving experiential knowledge. Scholarship distinguishes technical dimensions involving practical skills and know-how from cognitive dimensions encompassing mental models, beliefs, and shared understandings (Nonaka et al., 1996; Nonaka, 2009).

Knowledge management scholarship has predominantly developed within organizational settings, where tacit knowledge is treated as a resource for innovation, learning, and competitive advantage (Nonaka, 2009; Clarke, 2010). Nonaka's knowledge creation theory suggests that tacit knowledge can be partially externalised through dialogue, reflection, storytelling, and social interaction before becoming embedded in organisational routines and explicit systems (Nonaka, 2009). Knowledge creation is thus a continuous interaction between personal experience and collective learning.

However, tacit knowledge cannot be completely codified without losing contextual richness. Formal documentation may fail to capture the judgement, intuition, and situated understanding that give knowledge meaning (Clarke, 2010; Pathirage et al., 2008). Effective knowledge management therefore extends beyond documentation to participation, observation, mentoring, and collaborative practice (Von Krogh et al., 2000; Wiig, 2007). Preservation requires maintaining the conditions through which knowledge is created, interpreted, and transmitted.

These challenges are particularly pronounced in informal communities, which often lack the governance structures, standardized workflows, and incentives for documenting knowledge found in organizations (José Zapata Campos et al., 2023). Instead, knowledge is embedded in everyday practices, cultural traditions, family relationships, and collective experiences (Kohsaka & Rogel, 2021). Organizational

approaches therefore cannot simply be transferred to communities without accounting for the social and cultural processes through which knowledge is maintained. Human-centred and culturally responsive approaches recognize storytelling, apprenticeship, mentorship, and collective participation as legitimate knowledge-management practices (Jasanoff, 2004; Ijatuyi et al., 2025; Liguori et al., 2025).

Digital technologies create opportunities for documenting and sharing experiential knowledge through repositories, mobile applications, multimedia archives, and community-based platforms (Zamiri & Esmaeili, 2024; Chen & Nunes, 2019). Yet technological solutions alone cannot sustain tacit knowledge because they capture only part of what individuals know (Johannessen et al., 2001). Their effectiveness depends on reinforcing existing social-learning practices rather than replacing them (Valk & Planojevic, 2021), particularly in communities characterized by oral traditions, limited digital literacy, and culturally embedded knowledge transmission (Khan & Gope, 2025; Liguori et al., 2025). Thus, digital technologies should complement interpersonal learning and participation.

Although tacit knowledge management has been extensively studied in organizational research (Nonaka, 2009; Clarke, 2010; Nonaka et al., 1996), its application to informal livelihood communities remains limited. Small-scale fisherfolk are important because their knowledge is ecological, social, cultural, and economic, while remaining predominantly tacit and community-based (Knudsen, 2008; Wilson et al., 2006). Extending knowledge management to such contexts requires understanding knowledge as socially situated, culturally embedded, and continually recreated within local social-ecological systems.

2.2. Local Ecological Knowledge, Social-Ecological Systems and Sustainability

Sustainability research increasingly recognizes that environmental stewardship depends not only on ecological conservation but also on the knowledge systems through which communities understand and adapt to changing environments (Folke et al., 2002; Berkes, 2009). Contemporary scholarship conceptualises societies and ecosystems as interconnected social-ecological systems in which ecological processes, cultural practices, institutions, and livelihoods influence one another (Berkes et al., 2000; Folke et al., 2002). Within these systems, knowledge is an adaptive resource enabling communities to interpret environmental change, coordinate collective action, and sustain livelihoods under uncertainty.

Local ecological knowledge (LEK), accumulated through generations of interaction with particular environments, is an important component of sustainability and environmental governance (Berkes, 2009). Unlike scientific knowledge, which often seeks general explanations, LEK is contextual and develops through observation, experimentation, and lived experience (Johannes et al., 2000; Berkes, 2009). It enables communities to detect environmental change, understand ecosystem dynamics, and adapt resource-use practices. Because it develops through continuing interaction with changing environments, LEK is dynamic rather than static (Berkes et al., 2000).

This perspective informs research on adaptive governance and community resilience. Adaptive governance emphasizes the capacity of communities and institutions to learn, respond, and reorganize in response to ecological change (Folke et al., 2005). Resilience scholarship similarly highlights communities' capacity to generate, preserve, and mobilize knowledge through social learning and collective action (Folke et al., 2002; Berkes, 2009). Tacit knowledge is particularly relevant where formal scientific information is unavailable, incomplete, or insufficiently localized (Sanford et al., 2020; Bennett III, 1998).

Commons-governance scholarship emphasizes local institutions, trust, and collective action in sustainable management of shared resources (Ostrom, 1990; Armitage, 2008; Albareda & Sison, 2020; Guttmann, 2021). Communities develop locally appropriate rules, norms, and monitoring practices that balance livelihood needs with conservation (Ostrom, 2008; Ziem Bonye et al., 2022). These arrangements depend not only on formal regulation but also on shared experiences, cultural values, and tacit understandings developed through social interaction (Ostrom, 1990; Berkes, 2009). Knowledge preservation therefore contributes to ecological understanding and collective stewardship.

More recent scholarship emphasizes knowledge co-production, whereby environmental knowledge emerges through interactions among communities, governments, researchers, and other stakeholders (Käyhkö et al., 2025; Norström et al., 2020; Maclean et al., 2022). Rather than positioning local knowledge as an alternative to science, this perspective recognizes the value of integrating experiential, cultural, and scientific knowledge while respecting their distinct legitimacy and contextual value (Armitage et al., 2011; Tengö et al., 2014). Collectively, these perspectives position tacit knowledge as a resource supporting environmental learning, adaptive governance, resilience, and sustainable livelihoods. Preserving it therefore requires sustaining the cultural practices, institutional relationships, and collective learning processes through which knowledge evolves.

2.3. Tacit Knowledge within Small-Scale Fisheries

Small-scale fisheries provide a particularly important context for examining interactions among knowledge, livelihoods, and sustainability. Fisherfolk possess sophisticated tacit knowledge developed through long-term interaction with aquatic environments, informing decisions about fish behaviour, seasonal variability, tides, habitats, weather, and fishing techniques (Johannes et al., 2000; Wilson et al., 2006; Knudsen, 2008; Léopold et al., 2014). This knowledge develops through observation, experimentation, and repeated engagement with local ecosystems, enabling adaptation to changing environmental conditions.

Fisherfolk's tacit knowledge has several characteristics. First, it is highly

contextual, reflecting particular rivers, lakes, coastal waters, and marine environments rather than universal principles (Knudsen, 2008; Santha, 2008). Fishing methods, navigation, gear selection, and environmental interpretation are adjusted to local species, hydrological conditions, and seasonal cycles. Second, it is experiential and embodied, acquired primarily through apprenticeship, observation, and participation alongside experienced fishers (Johannessen, 2022; Knudsen, 2008). Skills such as interpreting wind and currents, recognizing spawning periods, locating fishing grounds, repairing equipment, and responding to changing weather depend on repeated practice and accumulated experience. Third, knowledge is embedded in social and cultural relationships and transmitted through families, community networks, storytelling, collective fishing, rituals, and informal mentoring (Johannessen, 2022; Wilson et al., 2006).

Fisheries research also demonstrates that local ecological knowledge contributes to sustainable resource management. Experienced fishers may possess detailed knowledge of spawning seasons, habitat protection, species behaviour, and environmental variability that complements scientific approaches (Johannes et al., 2000; Wilson et al., 2006; Léopold et al., 2014). Integrating such knowledge into fisheries management can strengthen adaptive decision-making, community participation, and the legitimacy of conservation initiatives (Berkes, 2009). Importantly, fisherfolk's knowledge is not static but evolves in response to environmental change, technological developments, and shifting livelihood conditions.

Despite this scholarship, research has largely approached fisherfolk's knowledge from ecological or fisheries-management perspectives. Less attention has been given to how tacit knowledge is itself managed, preserved, transmitted, and renewed as traditional livelihood systems face social, economic, and environmental change. Studies also rarely integrate knowledge-management theory with sustainability scholarship to explain how ecological knowledge, socio-cultural practices, and livelihood strategies collectively support community resilience. Comparative research across developing-country contexts remains limited. Understanding these systems therefore requires attention not only to what fisherfolk know but also to how social relationships, power, and changing livelihoods shape knowledge production and transmission.

2.4. Power, Knowledge and Changing Fishing Communities

Local ecological knowledge should not be understood as static, homogeneous, or equally shared within communities. Knowledge is socially situated and shaped by power relations, cultural norms, institutions, and historical experiences that influence whose knowledge is generated, transmitted, recognized, and acted upon (Jasanoff, 2004; Cervelló-Royo et al., 2026). Knowledge preservation therefore requires attention to both knowledge content and the processes through which it is produced, negotiated, and transformed.

Knowledge is distributed unevenly according to experience, age, gender, livelihood roles, and participation in community activities (Berkes, 2009; Johannessen, 2022). Experienced fishers often hold extensive environmental knowledge, while younger generations may develop knowledge associated with emerging technologies, markets, or alternative livelihoods (Hoschke et al., 2024; da Silva Lima et al., 2025). Women, despite often being less visible in harvesting, contribute substantially through fish processing, net weaving, household resource management, post-harvest activities, and intergenerational transmission of practical and cultural knowledge (Weeratunge et al., 2010; Ghosh et al., 2026). Recognising these diverse knowledge holders provides a more comprehensive account of community knowledge systems.

Knowledge systems are also reshaped by climate change, environmental degradation, declining fish stocks, industrial fishing, market integration, technological innovation, and changing regulation (Pauly et al., 1998; Berkes, 2009; Zetina-Rejón et al., 2022; Ullah et al., 2024). As ecological conditions become less predictable, traditional indicators may become less reliable, requiring communities to modify practices and integrate new information (Moller et al., 2004). These changes demonstrate the adaptive character of local knowledge, which evolves through continuous learning and adjustment (Jorna et al., 2009).

Social and economic transformations likewise affect intergenerational transmission. Education, labour mobility, urbanisation, and changing livelihood aspirations can reduce younger generations' participation in traditional apprenticeship and community-learning practices (Jütting & de Laiglesia, 2009; Miah & Islam, 2020). As experiential learning becomes less embedded in everyday fishing, knowledge continuity is increasingly challenged (Gustavsson & Riley, 2018). Sustainability-oriented knowledge management should therefore treat knowledge as dynamic and negotiated within changing social-ecological systems, creating opportunities for intergenerational dialogue and interaction among experiential knowledge, scientific knowledge, and emerging technologies (Silva-Ávila et al., 2025; Jakes, 2024). Such approaches can support knowledge-system evolution while maintaining cultural continuity (Jakes, 2024; Berkes et al., 2000; Berkes, 2009; Kohsaka & Rogel, 2021).

2.5. Towards a Sustainability-Oriented Tacit Knowledge Management Framework

The literature reveals three complementary but largely disconnected bodies of scholarship. Knowledge-management research explains how tacit knowledge can be captured, shared, and maintained but has predominantly focused on organizations (Nonaka, 2009; Clarke, 2010; Chen & Nunes, 2019). Sustainability research emphasizes LEK, adaptive governance, resilience, and social-ecological sustainability but pays less attention to processes through which knowledge is preserved and transmitted (Folke et al., 2002; Berkes, 2009; Ostrom, 1990). Fisheries research documents the sustainability value of fisherfolk's ecological knowledge but rarely examines how knowledge-management principles could strengthen its continuity amid environmental and social change (Johannessen, 2022; Knudsen, 2008; Wilson et al.,

2006).

Preserving fisherfolk's tacit knowledge requires more than documentation. Because knowledge is experiential, culturally embedded, and recreated through participation, management must support processes through which knowledge is generated, shared, adapted, and renewed (José Zapata Campos et al., 2023; Kohsaka & Rogel, 2021; Ijatuyi et al., 2025; Liguori et al., 2025). Preservation therefore includes the relationships, institutions, cultural practices, and learning environments that sustain community knowledge (Von Krogh et al., 2000; Wiig, 2007).

Digital technologies offer opportunities through mobile applications, digital archives, multimedia storytelling, community media, and participatory repositories (Chen & Nunes, 2019; Khan & Gope, 2025). However, they should complement rather than replace apprenticeship, storytelling, mentoring, and collective learning (Khan & Gope, 2025; Liguori et al., 2025; Valk & Planojevic, 2021). Human-centred and culturally responsive approaches are essential to ensure technology strengthens rather than disrupts locally embedded knowledge systems (Jasanoff, 2004; Liguori et al., 2025).

Despite growing recognition of these issues, empirical research examining sustainability-oriented knowledge management with fisherfolk in developing-country contexts remains limited. Existing studies rarely integrate knowledge-management theory, LEK, and sustainability scholarship within a single framework or examine how tacit knowledge is preserved, shared, and adapted across social-ecological settings. Consequently, understanding remains limited regarding how knowledge management can support ecological stewardship, resilience, cultural continuity, and sustainable livelihoods.

Addressing this gap, the present study integrates tacit knowledge-management theory with scholarship on LEK and social-ecological systems through a comparative qualitative study of fisherfolk communities in Bangladesh and Indonesia. It examines forms of tacit knowledge supporting sustainable livelihoods, mechanisms through which knowledge is preserved and shared, and challenges and opportunities for maintaining these systems amid environmental and socio-economic change. Building on these insights, the study develops a sustainability-oriented Tacit Knowledge Management Framework supporting long-term preservation, adaptation, and intergenerational transmission while recognizing community participation, cultural practices, and appropriate digital technologies.

3. Methods

We conducted a comparative qualitative study in Bangladesh and Indonesia to examine how tacit knowledge is preserved, shared, and adapted within small-scale fisherfolk communities. The study explored forms of tacit knowledge supporting sustainable livelihoods, processes through which it is transmitted, challenges to continuity, and the

development of a sustainability-oriented Tacit Knowledge Management Framework. Data were collected through focus group discussions (FGDs) with fisherfolk and key informant interviews (KIIs) with local government officials, fish-business actors, NGO workers, and fisherfolk association leaders.

3.1. Focus Group Design

FGDs explored how tacit knowledge is acquired, practiced, preserved, and shared. Separate groups were conducted with men and women because women often felt uncomfortable speaking in front of men. Discussions followed a storytelling approach, beginning with "Please describe a usual day in your life," before exploring information practices, decision-making, responsibilities, career aspirations, learning, challenges, and environmental issues. Women not directly involved in fishing also discussed their contributions to fishing-related knowledge practices.

3.2. Interview Design

KIIs complemented fisherfolk perspectives by examining stakeholder views on knowledge transmission, livelihood challenges, and opportunities and constraints for preserving tacit knowledge. Interviews explored stakeholder engagement with fisherfolk, sustainability-related knowledge practices, livelihood challenges, and perceptions of knowledge management solutions, including digital approaches.

3.3. Recruitment

Fisherfolk and stakeholders were recruited with assistance from two local partner organizations in Bangladesh and Indonesia that had long-term relationships with fishing communities. Additional key informants were recruited through the researchers' contacts.

3.4. Data Collection

Bangladesh and Indonesia were selected because fisherfolk in both contexts face environmental and socio-economic challenges while relying extensively on local knowledge, despite differing ecological and socio-cultural conditions. We conducted eight FGDs in Barguna and Chandpur districts, Bangladesh, and eight in South Galesong, Mangarabombang, and North Galesong districts, Indonesia. We also conducted 20 KIIs. FGDs were conducted in person, while KIIs were conducted either in person or via Zoom. FGDs lasted approximately one hour and KIIs 45-60 minutes. Informed consent was obtained following provision of the explanatory statement. All sessions were conducted in local languages and audio-recorded with participants' consent.

3.5. Research Ethics and Pilot

Data collection followed approval from the Human Research Ethics Committee of the corresponding author's affiliated institution (Project ID: 35456; Reference: 2023-35456-89937). One pilot FGD was conducted to train the Bangladesh research

assistants, resulting in no changes to the discussion protocol.

3.6. Data Analysis

We used Thematic Analysis (Nowell et al., 2017), supported by NVivo. Following repeated reading of transcripts and notes, open coding was conducted from participants' accounts rather than a pre-existing codebook. Related codes were grouped into broader themes and reviewed to identify relationships among ecological, social, cultural, institutional, and technological dimensions of tacit knowledge management.

Analysis was conducted within and across the Bangladesh and Indonesia datasets to identify recurring patterns, context-specific practices, and similarities and differences in knowledge forms, preservation, transmission, and future management. Relationships among themes were also examined, particularly between ecological knowledge and transmission practices, changing conditions and knowledge continuity, and technology expectations and existing knowledge-sharing practices. This enabled tacit knowledge to be interpreted as part of an interconnected social-ecological system.

One author conducted the analysis using NVivo, while three authors cross-checked a subset of the coding to enhance consistency and credibility. More than 200 codes were grouped into 14 themes, which informed the inductive development of the sustainability-oriented Tacit Knowledge Management Framework presented later.

4. Results

Analysis of the focus group discussions and key informant interviews (KIIs) identified fourteen themes concerning the forms, preservation, sharing, and continuity of fisherfolk's tacit knowledge. Across Bangladesh and Indonesia, knowledge was embedded primarily in everyday fishing and livelihood activities rather than formal documentation. Participants described observation, participation, storytelling, mentorship, collective work, and cultural practices as key mechanisms of knowledge acquisition and transmission. Continuity was increasingly affected by generational change, environmental uncertainty, changing livelihood aspirations, and unequal access to technology. While similar practices occurred across both countries, participants also identified context-specific practices shaped by local environments, fishing activities, and community structures. The findings are presented according to the three research questions.

4.1 Forms of Tacit Knowledge among Fisherfolk

Participants described interconnected forms of ecological, technical, livelihood, social, and cultural knowledge. These were rarely used in isolation; decisions about where and when to fish, for example, combined knowledge of weather, water conditions, fish behaviour, navigation, fishing techniques, and species availability.

4.1.1. Ecological and Environmental Knowledge

Participants in both countries described detailed knowledge of fish behaviour,

seasonal cycles, weather, water depth, currents, tides, and breeding periods, acquired primarily through repeated observation and experience. Environmental indicators were interpreted collectively when deciding when, where, and how to fish. A fisherman from Chandpur, Bangladesh, explained:

> When the sky is dark in the northeast, we know a storm is coming.

Participants also used seasonal and lunar patterns to identify periods of increased fish activity. Bangladeshi participants referred to seasonal changes in Hilsa availability, particularly during the monsoon, while Indonesian participants described changes associated with lunar phases. Such knowledge was generally not expressed as formal rules but developed through repeated encounters with local environments.

Ecological knowledge also included resource regeneration and environmental protection. A fisheries officer in Barguna noted:

> We implement no-fishing zones during spawning seasons to protect fish populations, although it does make daily life harder for fishermen.

Similarly, a fisher from Soppeng, Indonesia, explained:

> We know when to let an area rest so that fish populations can recover.

Thus, participants' ecological knowledge encompassed both interpreting environmental conditions and recognising when fishing should be reduced or suspended.

4.1.2. Fishing and Technical knowledge

Participants described practical knowledge concerning fishing techniques, equipment, boats, navigation, and adapting methods to local conditions. Techniques varied according to rivers, lakes, coastal areas, and the sea. As a participant from Barguna explained:

> Our fishing methods change depending on whether we are fishing in rivers or the sea.

A fisher from Soppeng similarly stated:

> Our methods are adapted to the type of fish and the water body we are in.

Participants also described traditional tools and their local adaptation. A fisher from Chandpur noted:

> The design of bamboo traps in Chandpur is different from those in Barguna; it depends on the type of fish and the local environment.

Technical knowledge extended to boat maintenance, net preparation and repair, and navigation using stars, currents, and winds. A boat captain from Barguna explained:

> The stars and the winds are our compass when we are out at sea.

These skills remained important when modern navigation technologies were unavailable or unreliable. At the same time, participants reported increasing use of GPS and other technologies in some larger-scale operations, although access was more limited among small-scale and family-based fishers.

4.1.3. Resource Use and Livelihood Practices

Participants' knowledge extended beyond catching fish to processing, trading, income management, equipment acquisition, and collective economic activities. In several communities, fisherfolk pooled resources, shared income, purchased equipment, and negotiated prices. A fishermen's association chair in Chandpur explained:

> Pooling our resources allows us to buy expensive gear and negotiate better prices for our catch.

Participants also described specialised roles in fish processing and trade, often differentiated by gender and household responsibilities. A shop owner in Chandpur highlighted the role of processors:

> Fish processors may play a vital role in preparing our catch for the market, ensuring that it is of high quality.

Thus, fisherfolk knowledge encompassed the wider livelihood system through which catches were processed, marketed, and converted into household income.

4.1.4. Social, Cultural, and Gendered Knowledge

Knowledge was embedded in family and community relationships and shared among experienced and inexperienced fishers, family members, neighbours, community groups, and fishing associations.

Gender shaped these knowledge pathways. Women who did not directly participate in fishing described involvement in net weaving, fish processing, household preparation, and other fishing-related activities. A woman from Soppeng explained:

> I helped my husband prepare fishing nets and all the preparations before he went to the lake.

A woman from Bishnupur, Bangladesh, described traditional net-making knowledge:

> The needle and thread were made at home. Needles were made of bamboo and were used to make nets by twisting thread on them.

Men more frequently discussed navigation, boat maintenance, fishing techniques, and environmental interpretation, while women described net weaving, processing, household preparation, and post-harvest activities. Participants also described prayers, ceremonies, and other cultural practices associated with fishing. An elder from Barguna stated:

> Cultural practices are deeply rooted in our fishing activities and ensure the continuity of our traditions.

Indonesian participants referred to Pesta Laut, while Bangladeshi participants described prayers or religious practices before fishing. These practices connected fishing with cultural beliefs, community identity, and relationships with the natural environment.

4.2 Preservation and Sharing of Tacit Knowledge

Tacit knowledge was preserved and shared primarily through everyday participation rather than formal repositories. Participants identified observation, intergenerational learning, mentorship, collective work, storytelling, rituals, and community interaction as central mechanisms. Digital technologies and local media provided additional possibilities but were generally viewed as complements to established practices.

4.2.1. Intergenerational and Experiential Learning

Direct participation in fishing and related livelihood activities was the principal mechanism of knowledge acquisition. Younger members learned by accompanying parents, grandparents, and experienced community members. A fisheries officer from Barguna explained:

> Nobody taught the fishermen. They acquired the techniques of fishing from their ancestors.

Participants described learning net casting, boat handling, navigation, equipment maintenance, and environmental interpretation through repeated practice. An Indonesian fisherman stated:

> My grandfather taught me how to read the sea and understand the currents. You can only learn it by being out there, not from any book.

Mentorship also involved learning when to stop fishing, respond to environmental conditions, and behave responsibly toward nature:

> It's not just about catching fish; it's about respecting the sea and knowing when to stop.

However, participants reported that opportunities for such intergenerational learning were declining as younger people pursued alternative livelihoods.

4.2.2. Community-based Knowledge Sharing

Families, neighbours, fishing groups, and community associations provided important settings for knowledge exchange. Fishing trips, net repair, preparation, marketplace activities, and community gatherings simultaneously served productive and learning functions.

Women identified net weaving as an important setting for informal knowledge exchange. A woman from Chandpur stated:

> If we didn't know how to weave, we asked someone from the adjacent house to show us. That's how we all learned to weave the nets.

Indonesian participants similarly explained:

> We gather to mend the nets together, and during these times, we exchange stories and tips about the sea and fishing.

Fishing expeditions were another important setting:

> When we go out to sea, we teach the younger ones about the tides, the stars, and the winds. This is how we keep our traditions alive.

Festivals and religious gatherings also provided opportunities to share experiences and lessons. An elder from Barguna explained:

> During our festivals, the stories we tell are as important as the prayers. They remind us of what we've learned and what we need to teach.

4.2.3. Gendered Knowledge Practices

Knowledge preservation reflected gendered divisions of labour. Women commonly transmitted knowledge concerning net weaving, fish processing, household preparation, and post-harvest activities, while men more often transmitted knowledge concerning fishing techniques, boat maintenance, navigation, and environmental interpretation.

A participant explained:

> My father taught me how to repair nets and maintain the boat. These are skills you cannot learn from books, only by doing.

However, these divisions were not absolute. Joint activities, including group net repair in Indonesia, brought community members together and enabled the exchange of fishing experiences and practical knowledge.

4.2.4. Rituals, Storytelling, and Collective Activities

Rituals and cultural practices provided additional mechanisms for remembering and communicating knowledge. Indonesian participants referred to Pesta Laut and other fishing-season ceremonies, while Bangladeshi participants described prayers associated with fishing trips. One participant explained:

> We believe that the sea gives and takes. ... Before we go out, we pray not just for safety but to remind ourselves of our place [in this cycle].

Storytelling was embedded in these activities, with elders recounting previous experiences, environmental changes, and lessons for younger generations. Thus, rituals and storytelling were not separate from practical knowledge but provided ways of communicating experience and community understandings alongside fishing activities.

4.2.5. Local Media and Digital Technologies

Local radio was identified as an established mechanism for communicating weather information, fishing restrictions, and other practical information:

> The radio tells us when it's safe to fish and when we need to stay away due to government restrictions or bad weather. It's our lifeline.

Radio programmes featuring experienced fishers also enabled older knowledge to reach wider audiences:

> On the radio, they sometimes interview the older fishermen who talk about how they used to fish and what's different now. It's a way for us to learn and remember.

Digital technologies represented a newer and prospective mechanism. Participants discussed mobile phones, applications, videos, and online archives as ways to document and share fishing knowledge. A Barguna official observed:

> If the process of the digital platform is easy and attractive, it has potential.

An elder from Chandpur similarly noted:

> We hear about what other fishermen are doing in other parts of the country through our phones. [It's a new way of learning, and it helps us see things differently].

However, participants generally viewed digital technologies as complementary to experiential learning rather than replacements for interpersonal practices.

4.3 Challenges and Expectations Regarding Tacit Knowledge Continuity

Participants identified interconnected challenges to knowledge continuity, including declining youth participation, migration, changing livelihood aspirations, dependence on oral and demonstration-based transmission, environmental change, technological transformation, and unequal digital access. They nevertheless expressed expectations for community-based and digitally supported preservation.

4.3.1. Generational Change and Youth Migration

Declining youth participation in fishing was a major concern. Participants described younger people as increasingly attracted to occupations perceived as more stable or economically rewarding. A participant from Barguna reflected:

> My son says, 'Should I be a fisherman just because my father is one? ... I may move to [other jobs that are much more reliable and stable].'

Indonesian participants similarly stated:

> Our sons leave for the city, and they no longer have the skills or interest in fishing.

Participants linked this directly to reduced opportunities for intergenerational learning. The concern was therefore not only that fewer young people would become fishers, but that they would have fewer opportunities to acquire environmental, technical, cultural, and community knowledge.

4.3.2. Environmental and Livelihood Changes

Environmental changes affected both fishing practices and knowledge transmission. Participants reported changes in weather, aquatic environments, fish availability, and fishing technologies that made established practices less predictable or less frequently used. A fisher from Barguna observed:

> The young ones think our ways are old-fashioned. They prefer the new machines, but those don't teach you how to understand the sea [nature].

Participants described a tension between experiential knowledge and newer technologies. Modern equipment could support navigation and fishing while reducing

reliance on some traditional skills. Environmental changes also interacted with livelihood conditions: when fishing became less economically reliable, young people were more likely to seek alternative employment, simultaneously reducing opportunities for knowledge continuity.

4.3.3. Oral and Demonstration-Based Transmission

Participants identified the predominantly oral, observational, and demonstration-based nature of knowledge transmission as a major vulnerability. Much knowledge remained undocumented. An elderly fisherfolk participant stated:

> We [older fisherfolk] have so much knowledge about the tides, the fish, and the weather, but if the youth don't learn it, all this will disappear with us.

Participants described knowledge as residing in memories, bodies, practices, and experiences rather than written records. This was particularly problematic for knowledge requiring repeated observation and practical demonstration, which participants considered difficult to communicate through conventional written materials.

4.3.4. Digital Access and Technology-Related Constraints

Although participants expressed interest in digital approaches, they identified unequal access to devices, limited connectivity, financial constraints, and differences in digital literacy, particularly among older knowledge holders. An elderly fisherfolk participant from Barguna explained:

> We hear about these new technologies, but they are difficult to understand and use. We rely on what we know, not on machines.

Participants therefore emphasised that access to technology alone was insufficient. Training and institutional support were also required. A local leader in Barguna stated:

> We need training and support to use these new tools effectively. It's not enough to have them; we need to know how to use them to benefit our community.

Participants also cautioned against replacing established practices with technology. A fisherfolk participant from Chandpur explained:

> The stories and lessons passed down by our elders are precious. We can't lose that connection [by relying too much on gadgets].

4.3.5. Expectations for Future Knowledge Preservation and Sharing

Participants proposed digital documentation, community workshops, intergenerational learning, educational initiatives, and greater government and NGO involvement.

Digital archives could preserve fishing techniques, oral histories, environmental observations, and cultural practices. A young Indonesian fisherfolk participant explained:

> We want to use technology not just for new things, but to keep our old ways alive, so we can pass them on even if we move away.

A community leader in Chandpur similarly stated:

> If we can record our knowledge, our children can learn about their heritage, no matter where they are.

Participants nevertheless stressed that documentation should be combined with teaching and community participation. Younger participants expressed interest in mobile applications, videos, and online archives alongside existing learning practices:

> We want to use apps and videos to learn new things and keep the old ways alive. It's about mixing the new with the old.

Participants also expected government agencies, NGOs, and other external actors to provide infrastructure, training, and resources. Thus, future knowledge preservation was envisioned as a combination of community-based learning, documentation, appropriate technologies, and institutional support.

5. Discussion

5.1. Tacit Knowledge as an Interconnected Sustainability System

The findings suggest that fisherfolk's tacit knowledge is not a collection of discrete skills but an interconnected system in which ecological, socio-cultural, and livelihood knowledge are mutually dependent. Participants rarely used knowledge of weather, water conditions, navigation, fishing techniques, equipment, processing, or collective activities independently; rather, they combined these forms in context-specific decisions. This supports the view of tacit knowledge as contextual and practice-based (Polanyi, 1966; Nonaka, 2009; Clarke, 2010), while extending it from individual expertise to a community-level social-ecological system.

Ecological knowledge formed the environmental basis of decision-making. Participants interpreted weather, currents, tides, fish behaviour, seasonal patterns, and breeding periods through accumulated experience. Consistent with local ecological knowledge scholarship, such understandings emerge through repeated interaction with particular environments and cannot readily be separated from the places in which they develop (Berkes, 2009; Knudsen, 2008). This knowledge was enacted in decisions about when and where to fish, which techniques to use, and when to reduce or suspend fishing, making it part of how communities respond to their environments.

Ecological knowledge was also embedded in socio-cultural practices. Fishing, equipment repair, rituals, community interaction, and collective resource management provided settings in which knowledge was learned and reproduced. Economic practices were similarly interconnected: fish processing, trade, equipment acquisition, income distribution, and collective activities translated ecological knowledge into livelihood outcomes. Conversely, declining economic attractiveness of fishing reduced young people's participation and therefore opportunities for experiential learning. Thus, knowledge supports livelihoods while changing livelihood conditions influence whether knowledge is reproduced. These findings reinforce the social-ecological systems perspective that knowledge is embedded in relationships among communities, institutions, cultural practices, and environments (Berkes et al., 2000; Folke et al., 2002).

This interdependence provides the empirical basis for Figure 1. Ecological, socio-cultural, and economic knowledge are conceptualised as overlapping dimensions of one fisherfolk knowledge system. Their intersections include fishing techniques linking ecological conditions and livelihoods, community engagement connecting social relationships and economic cooperation, ritual practices linking cultural continuity with environmental relationships, and resource management connecting ecological, social, and livelihood interests.

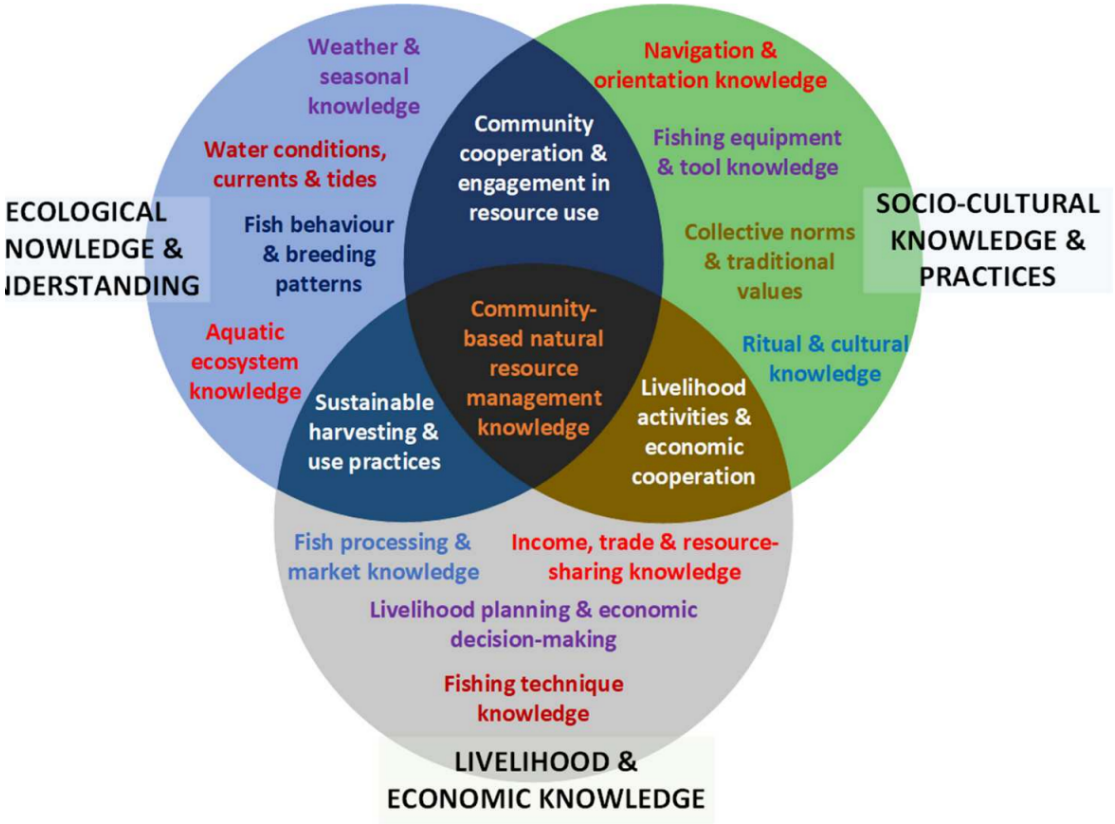


Figure 1 Important Tacit Knowledge Components and their inter-relationship.

Importantly, the findings do not imply that every traditional practice is inherently sustainable or that fisherfolk always manage resources sustainably. Rather, they demonstrate situated knowledge and collective practices through which environmental conditions, social relationships, and livelihood needs are negotiated. Because local knowledge systems are dynamic and must respond to changing conditions (Berkes, 2009; Folke et al., 2002), sustainability here concerns the capacity for continued learning, adaptation, and livelihood continuity rather than preservation of existing practices unchanged.

5.2. Knowledge Continuity as a Social and Adaptive Process

Knowledge continuity depended primarily on the social practices through which knowledge was learned. Because tacit knowledge is embodied in experience and practice, it cannot simply be transferred through conventional repositories (Polanyi, 1966; Nonaka, 2009; Clarke, 2010). Participants learned by accompanying experienced fishers, observing and performing activities, receiving guidance, listening to stories, and joining collective work. Preservation therefore occurred through continued participation rather than storage alone.

This qualifies conventional knowledge-management approaches that emphasise identifying, externalising, storing, and disseminating knowledge (Nonaka, 2009; Chen & Nunes, 2019). In fisherfolk communities, preservation is inseparable from apprenticeship, mentorship, demonstration, storytelling, rituals, and collective work. Documentation can preserve representations of experience, but cannot by itself reproduce the embodied judgement involved in interpreting environments or performing fishing practices. Knowledge management must therefore sustain opportunities for people to learn with and from one another.

Generational change makes this especially important. Participants linked knowledge erosion to youth migration, alternative livelihood aspirations, and declining participation in fishing, rather than simply to the absence of documentation. Reduced participation weakens apprenticeship, collective exchange, and routine enactment, raising a broader question than "how can knowledge be captured?"—namely, "how can the social conditions that allow knowledge to be learned be sustained?" Knowledge continuity is also adaptive rather than simple reproduction. Participants described changing environments, technologies, and livelihoods alongside adoption of GPS and mobile phones. Continuity may therefore involve retaining experiential principles and community meanings while adapting their application. This is consistent with resilience and adaptive governance perspectives, where learning, reorganisation, and response to change underpin social-ecological persistence (Folke et al., 2002; Folke et al., 2005).

Gender further demonstrates that community knowledge is distributed across livelihood roles. Women described net weaving, processing, household preparation, and

post-harvest knowledge, while men more often described navigation, boat maintenance, and fishing techniques. A knowledge-management approach focused only on fishing trips or male fishers would therefore exclude part of the knowledge system. These patterns should not be treated as universal or fixed; they represent the different pathways described by participants.

Overall, knowledge continuity depends on three conditions: opportunities for intergenerational learning, recognition of multiple knowledge holders and pathways, and capacity to adapt knowledge as environmental and livelihood conditions change. These conditions connect the findings to the proposed framework.

5.3. Sustainability-oriented Knowledge Management Framework

The framework presented in Figure 2 was developed from relationships identified in the findings rather than from the assumption that fisherfolk require a conventional organisational knowledge-management system. It starts from the interconnected knowledge system in Figure 1 and asks how ecological, socio-cultural, and economic knowledge can be supported as the social conditions enabling transmission become less stable.

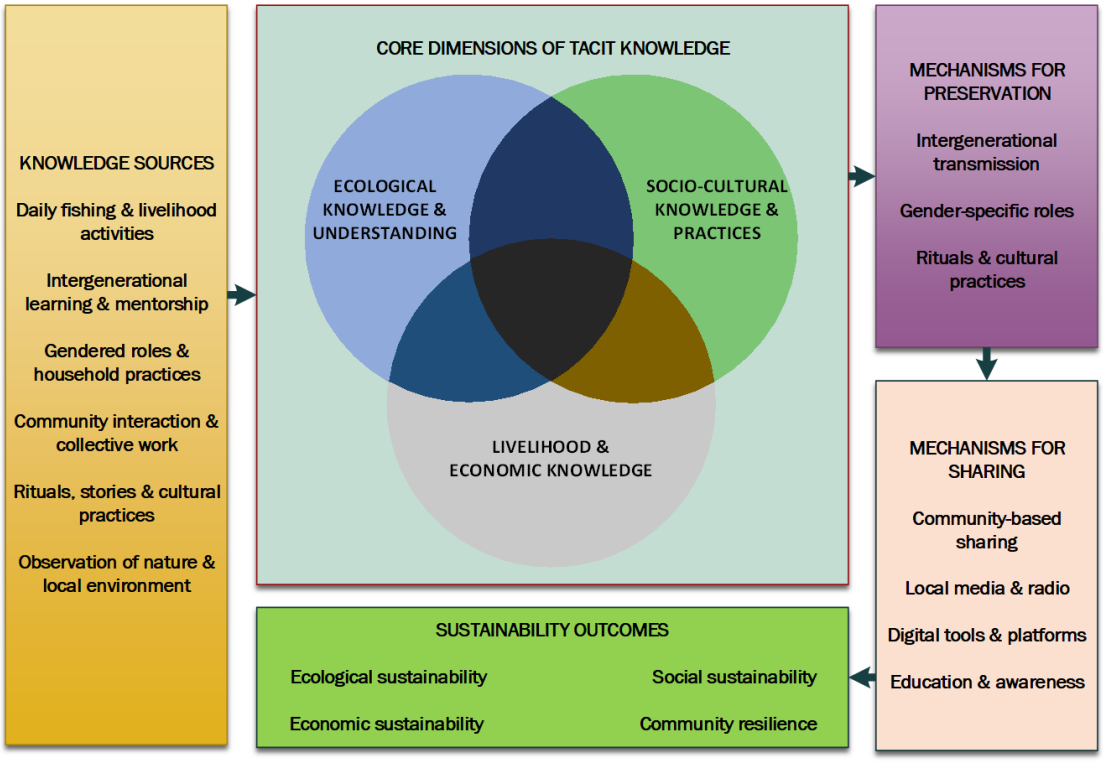


Figure 2 Tacit Knowledge Management Framework for Fisherfolk

Preservation mechanisms should strengthen rather than bypass existing practices. Intergenerational learning, cultural rituals, and gendered knowledge pathways were identified as existing mechanisms of continuity and therefore form the preservation

component of Figure 2. Intergenerational learning addresses declining opportunities for younger people to learn from experienced knowledge holders, while recognition of gendered pathways helps ensure that women's fishing-related knowledge is not excluded.

Similarly, storytelling, mentorship, collective activities, community interaction, and local media form the sharing mechanisms. Their value lies in their compatibility with the social character of fisherfolk knowledge: community-based sharing allows experiences to be communicated without requiring complete conversion into standardised information.

Technology should therefore complement, not replace, these practices. Participants expressed interest in digital archives, mobile applications, and videos while also identifying digital-literacy and access constraints. This supports a complementary model in which technologies extend the reach and continuity of existing practices, consistent with research showing that technologies for tacit knowledge management are most effective when they reinforce social learning rather than substitute for it (Chen & Nunes, 2019; Valk & Planojevic, 2021).

Importantly, preserving tacit knowledge differs from documenting expressions of it. Narratives, videos, photographs, or audio recordings can preserve representations of experience but cannot reproduce all embodied judgement. The framework therefore supports the elicitation, documentation, accessibility, and intergenerational transmission of manifestations of tacit knowledge, while experiential learning remains necessary for developing competence, consistent with Polanyi's (1966) conception of tacit knowledge.

The accessible knowledge repository in Figure 2 should consequently be understood as supporting infrastructure, not a container of tacit knowledge itself. It can retain and provide access to selected narratives, demonstrations, experiences, cultural practices, and other documented expressions. This links informal community practices with the formal preservation function of knowledge management while adapting organisational principles to a community context.

In this regard, table 1 provides selected examples of relationships identified across the analysis.

Table 1. Illustrative empirical links underpinning the framework

Illustrative finding	Knowledge source	Preservation / sharing mechanism	Core tacit knowledge dimension	Analytical link
Younger fishers learn tides, currents, navigation and fishing practice by accompanying experienced fishers and learning through repeated participation.	Intergenerational learning and lived experience	Experiential learning and mentorship	Ecological knowledge and fishing/technical knowledge	Environmental and technical knowledge is sustained because it is learned through participation rather than formal instruction.
Women described learning and sharing net weaving, processing and household preparation through neighbours, family members and collective activities.	Household and community interaction	Gendered knowledge pathways and community-based sharing	Socio-cultural and livelihood knowledge	Tacit knowledge is distributed across livelihood roles, showing that preservation depends on recognising multiple knowledge holders and social settings.
Rituals, festivals and storytelling were used to communicate experiences, environmental understanding and lessons across generations.	Cultural experience and collective memory	Rituals, storytelling and collective activities	Socio-cultural and ecological knowledge	Cultural practices do more than preserve identity; they provide settings in which environmental and practical knowledge is remembered and transmitted.
Participants discussed mobile phones, videos and digital archives as useful for documenting and extending access to fishing knowledge, while emphasizing that these should not replace interpersonal learning.	Existing community knowledge and documented experience	Digital tools and local media as complementary sharing mechanisms	Cross-cutting across ecological, socio-cultural and livelihood knowledge	Digital mechanisms can extend the reach of knowledge, but tacit knowledge remains dependent on experiential and social learning.

5.4. Designing for Complementarity rather than Replacement

The framework should not be understood as a linear transition from traditional to digital knowledge, but as complementarity. Participants already possessed functioning practices—including apprenticeship, storytelling, community activities, rituals, and local media—while the principal vulnerability arose from changing social conditions: youth migration, changing livelihoods, environmental change, and unequal digital access. A digital repository alone would therefore address only part of the problem.

Figure 2 consequently places preservation and sharing before the repository. Knowledge first exists within community practices and relationships; intergenerational learning, cultural practices, and gendered pathways maintain it; community sharing, mentorship, local media, and digital tools circulate it; and a repository retains documented expressions for future access. Tacit knowledge management is thus a continuous process of preserving, sharing, documenting, and renewing knowledge within its social, cultural, ecological, and livelihood contexts.

An open, narrative-oriented approach is preferable to requiring fisherfolk to translate knowledge into rigid information fields. Storytelling and experiential accounts already formed part of participants' practices, while digital familiarity varied. Knowledge holders should therefore be able to describe experiences in their own terms, with structured categorisation applied subsequently if needed. This extends Chen and Nunes's (2019) narrative approach to tacit knowledge into a socially and culturally embedded community context.

The framework consequently shifts emphasis from capturing tacit knowledge as an object to supporting the relationships and practices through which it can be expressed, documented, shared, and renewed. It uses knowledge-management mechanisms to reinforce, rather than replace, the social, cultural, ecological, and livelihood relationships through which fisherfolk knowledge is maintained.

6. Conclusion

This study examined how fisherfolk communities in Bangladesh and Indonesia preserve, share, and adapt tacit knowledge within changing social-ecological and livelihood conditions. The findings demonstrate that fisherfolk knowledge is an interconnected system linking ecological understanding, fishing and technical practices, livelihood activities, and social and cultural relationships. Knowledge is developed and applied through interaction with particular environments and participation in community life. Its sustainability significance therefore lies not in individual knowledge categories, but in the relationships through which knowledge supports livelihoods, community cohesion, learning, and adaptation.

Knowledge continuity depends primarily on the social processes through which it is learned and reproduced. Intergenerational learning, observation, mentorship,

storytelling, collective activities, rituals, and gendered livelihood practices were central mechanisms across both countries, although their expression varied according to local environments and community contexts. However, youth migration, changing livelihood aspirations, environmental and livelihood changes, and declining opportunities for participation are weakening these processes. The central challenge is therefore not simply insufficient documentation, but the erosion of the conditions through which knowledge is learned, interpreted, adapted, and renewed.

6.1. Contribution of the Tacit Knowledge Management Framework

Building on these findings, the study developed a sustainability-oriented Tacit Knowledge Management Framework that connects existing community practices with complementary knowledge-management mechanisms. Rather than replacing established ways of learning with technology, the framework strengthens community-based preservation and sharing while using local media and digital technologies where appropriate.

The framework makes two principal contributions. First, it extends tacit knowledge management beyond organisational settings by conceptualising knowledge as embedded within community relationships, cultural practices, livelihoods, and social-ecological contexts. Second, it distinguishes preserving tacit knowledge from documenting its expressions. Digital archives, recordings, narratives, and photographs can preserve accessible representations of community knowledge but cannot reproduce the embodied judgement developed through experience. Documentation should therefore support rather than substitute for experiential and intergenerational learning.

6.2. Implications, Limitations and Future Research

The findings suggest that knowledge-preservation initiatives should not focus exclusively on repositories or documentation. Governments, NGOs, and community organisations should support intergenerational learning, storytelling, mentorship, cultural practices, and recognition of diverse knowledge holders, while using accessible technologies to extend documentation and sharing. Digital interventions should be designed around existing practices and accompanied by appropriate training and institutional support.

The framework is inductively grounded in selected fisherfolk communities in Bangladesh and Indonesia and should therefore be understood as a contextually grounded conceptual framework rather than a universally validated model. Future research should implement and evaluate the framework in fishing communities, examine its adaptation across ecological and socio-economic contexts, and use longitudinal approaches to investigate how knowledge evolves alongside environmental change, technology, livelihoods, and generational relationships.

Overall, sustaining fisherfolk knowledge is not primarily a matter of transferring

traditional knowledge into repositories. It requires supporting the social, cultural, ecological, and livelihood relationships through which knowledge is continually learned and renewed. The proposed framework provides a pathway for connecting these practices with complementary mechanisms for documentation, sharing, and access while retaining experiential learning at the centre of knowledge continuity.

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