EDITORIAL

This Editorial is being published in the 20th year since this journal's founding in 2005. The year of 2025 also marks the 25th year of the existence of the Knowledge Management for Development (KM4Dev) community which is being celebrated in the '25 years together' campaign. Since the journal's first issue in 2005, we have published over 389 papers, spread over 41 issues in 18 volumes, covering many key themes of Knowledge Management for Development (KM4D), a hybrid field between mainstream knowledge management and sustainable development. We have had many Special Issues, focusing on a theme or geographical region in English, Spanish and French, and also a number of non-thematic issues.

This is a non-thematic issue, covering a wide range of themes relevant to the field of KM4D. These include transdisciplinary practice in the USA and Brazil, communities of practice, and an overview of KM4dev's multiple activities in 2024.

The poem
The first contribution in this issue is the poem 'Echoes of Knowledge' (Mabel Shu) which is the third poem that we have published in this journal. This reflects the journal team's and the KM4Dev community's recognition of the importance of multiple knowledges. Mabel also touches on many key themes, such as the importance of knowledge sharing, power, capacity building, epistemic justice and co-creation. In a creative way, it raises questions about knowledge management and different perspectives on it.

Papers
The second contribution is the first of the three papers, 'Transdisciplinarity as strategy: lessons from the Maine aquaculture industry, USA' (Katrina Pugh, Teresa Johnson, Linda Silka and Nancy Dixon), which examines the role of the Core Group of the Maine Aquaculture Hub, an organization established to develop aquaculture in Maine, USA. It is unusual for this journal to include a paper from research in the USA but we have included it in this case because it is very relevant to transdisciplinary practice, something very much aligned with the fifth and six generations in the generational framework of knowledge management proposed by KM4Dev (Boyes et al, 2023), and it provides a very useful example of interaction within communities of practice which have a global relevance. In particular, the methodology of conversation analysis and strategic thinking provides useful pointers on how KM4Dev itself can analyse and improve its own conversational interactions in both its knowledge cafes and its online discussion forum.[1]

In the next paper 'An analytical framework for examining communities of practice in water management: a reflection on what they do and contribute to?' (Laurent-Charles Tremblay Lévesque, Jeroen Warner, Jaime Hoogesteger, Gergana Majercakova and Nicolas Jarraud), the authors develop an analytical framework to understand better what water-related communities of practice do and what they contribute. The framework was co-developed, drawing from the experience of over 50 experts in communities of practice for water and environmental management. The research aims to assist coordinators of communities of practice to make more informed decisions about the design and maintenance of their water-related communities. However, the framework and approach is relevant to communities and other sectors.

The third paper, 'Confluence of knowledge: cyclical steps for transdisciplinary research in practice, Brazil' (Gabriela De La Rosa) shares insights from a transdisciplinary process co-developed with a fishing community and an academic research team in Brazil. It discusses steps for taking transdisciplinary research into practice, while also offering critical perspectives. By reflecting on these steps, the author aims to support researchers who involve multiple stakeholders and multiple knowledges to better understand the responsibilities and practical demands involved in converging different types of knowledges.

A review of KM4Dev in 2024
The final contribution in this issue is a Community Note 'The state of the Knowledge Management for Development (KM4Dev) community in 2024' (Toni Sittoni, Sarah Cummings, Bruce Boyes, Paul Atsu, Rocio Sanz, Denise Senmartin, Gladys Kemboi, Fitsum Habtemariam and Chris Zielinski). Written by members of the KM4Dev core group, it reviews, for the first time, the annual activities of KM4Dev, taking the year 2024. It starts with the top ten KM4dev buzzwords in 2024. Next, it review KM4Dev's known impact on sustainable development, focusing on the advocacy campaign to successfully influence the text of the UN's Pact of the Future (UN, 2024). Next, it provides an overview of KM4Dev's core activities: interactive platforms, knowledge cafes, the Youth Leadership Forum, the KM4Dev-SIKM peer mentoring programme, and the Knowledge Management for Development Journal. In the next section, it describes the people who have played a formal role in the community as members of the core group, celebrating the awards and academic achievements of KM4Dev's members. Next, it highlights some important activities: the face-to-face meeting which took place in Cape Town, South Africa in January, the support to the development of the fourth, forthcoming edition of the 'Agenda Knowledge for Development', new developments around the KM4Dev 'Knowledge Sharing toolkit', and some key events in the knowledge management and KM4Dev calendar. Finally, plans to celebrate the 25th anniversary of KM4Dev in 2025 in the '25 years together' campaign are briefly presented.

The *Knowledge Management for Development Journal* editorial team hopes you, the reader, enjoys these contributions and we look forward to publishing more issues in 2025 as we celebrate the journal's 20 year anniversary and '25 years together' with the KM4Dev community.

Sarah Cummings*,*
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[1] https://dgroups.io/g/km4dev/

POETRY

Echoes of Knowledge

Mabel Shu

Knowledge, we say is power, yet we undermine the power of knowledge
We say knowledge management is vital yet we struggle to manage knowledge
We talk about knowledge yet confuse it with information
We think knowledge, yet replace it with communication

Whether human, external or codified
The value and benefits of knowledge management must be amplified
Taking into consideration the need for knowledge to be simplified
Providing room for it to be verified
While understanding that contexts are diversified
And Hey! Be careful! Some knowledge is classified!

Responsible knowledge management promotes inclusivity
It does not fail to integrate diversity
And has the ability to foster equity
It recognises and acknowledges complexity
Leverages inclusive tools for adaptability
And considers the various levels of adoptability
While focusing on interoperability
And the need for strengthening capacity
Yes! These are all a necessity!

It includes the documentation of best practices
Involves the consideration of inclusive policies
Promotes the building of knowledge societies
Does not undermine the capture of local voices
And the need to mitigate biases
While shunning epistemic injustices
Hold on, before I forget! 'Our communities of practice'!

We must therefore make the process participatory
Not forgetting our culture and history We must document our stories
We must build our repositories

Within our respective territories
Don't forget! There are always boundaries!

How then do we ensure holistic stakeholder engagement?
How do we leverage community involvement?
How do we involve the government?
To ensure sustainable development?

Be critical and empirical in finding
Be selective and strategic in acquiring
Be innovative and collaborative in creating
Be generous and transparent in sharing
Be adaptive and practical in applying
Be deliberate and consistent in capturing
Don't stop! I hope you are still listening!

Responsible knowledge management goes way beyond establishing relationships
It involves building strategic partnerships
It depends on having participatory leadership
Because participation drives ownership
It's big enough! We all need to get on board this ship!

Through integration and co-creation
Innovation and collaboration
Adoption and adaptation
Democratisation and decolonisation
Inclusion and diversification
Can we find a solution
To ensure knowledge preservation
And foster social transformation
What then are you waiting for? Everyone has a function!

About the Author
Mabel Shu is a certified Knowledge Manager for Sustainable Development with extensive experience in community development, knowledge creation, and dissemination. She serves as the Knowledge Management Programme Assistant at the West Africa Civil Society Institute (WACSI), Ghana, where she curates, documents, and shares knowledge to strengthen civil society organizations in West Africa. Mabel is also an active member of the Knowledge Management for Agricultural Development (KM4AgD) community of practice, contributing

to innovative knowledge-sharing initiatives. Driven by her passion and dedication to guiding young professionals on their career paths, she created The Spark podcast, a platform that uses storytelling to inspire, educate, and provide mentorship to the next generation of leaders.
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Transdisciplinarity as strategy: lessons from the Maine aquaculture industry, USA

Katrina Pugh, Teresa Johnson, Linda Silka and Nancy Dixon

Practice theorists and strategy researchers have argued for a practice-lens, yet this is a new concept for sustainability scientists and development actors who are rooted in traditional research paradigms. Practice-to-strategy emerged as a throughline for the Maine Aquaculture Hub, an organization established to develop aquaculture in Maine, USA. The authors observed a six-month strategy process where the Hub's Core Team leaders engaged in sense-making about the aquaculture industry, go-to-market approaches, service-scope, and their own leadership. Transdisciplinary research was a concept familiar to the Core Team, and was even etched into the Hub's mission statement. However, they had not expected to find transdisciplinarity permeating the Hub's day-to-day work, namely educating citizens about aquaculture species, harbor-use, workforce gaps, and diversity. The Core Team reflected on the Hub's approach to its work: acting through others (a network mindset), exposing and including diverse ways of knowing (productive conversation), and decision-making processes which were collective, scientific and narrative (strategic thinking). This three-pronged approach represented what we dubbed 'practice-transdisciplinarity'. Practice-theory lies at the heart of practice-transdisciplinarity, as practice-theory combines diverse knowledge, systems thinking, and reflective processes as lenses into operations. Not only was practice-transdisciplinarity evident as the Hub Core Team reflected on operations, but it was also embodied by the Hub Core Team themselves, doing strategy-development. Practice-transdisciplinarity elements flowed into strategy considerations like open data, broadening the workforce, and partnerships. The authors theorize that practice-transdisciplinarity is relevant where organizations' resource limitations and policy constraints require inclusive design and responsive action. A self-conscious practice-transdisciplinarity throughline into strategy could help development organizations to surface hidden strengths and to develop strategy reflexively and inclusively.

Keywords: strategy; transdisciplinarity; practice theory; aquaculture; strategic thinking; networks; productive conversation; Maine; USA

1. Introduction

The choice of strategic planning processes has long been a source of debate among organization leaders and scholars (Mainardi & Kleiner, 2010). Do we maneuver around economic threats? Streamline operations? Pivot on a dime? Execute flawlessly? Just as the strategy process debates simmer on, so, too, do debates about the content of strategy. Many organizations across all sectors aim for a triple bottom line of people, profit, and planet (Kaplan & McMillan, 2021), but struggle with forming a strategy to accomplish all three.

What if the process and content of strategy were one? In other words, the expression of the organization's strategic advantage was the way strategy-making was done? This was the question we asked in our research on a Maine-based aquaculture initiative, the Maine Aquaculture Hub (the Hub). The Hub's mission was to help the aquaculture industry reduce barriers to growth through hands-on public training ('Aquaculture in Shared Waters' or AQSW), investment via the distribution of grants, and the creation of an industry roadmap (Sadusky et al., 2022). The Core Team leaders who were responsible for creating the strategy came from industry, academia, research, and community-development organizations. The Hub prided itself in cultivating what transdisciplinarity scholar, Mark Lawrence (2022) refers to as a sort of 'unity of knowledge.' The Hub had integrated various social and physical science ideas so that they could be understood by clammers (fishers) and investors, alike. From an economic development perspective in Maine, the stakes are high for aquaculture, as food security, alternative livelihoods and economic resilience are at risk (Cannon et al., 2023). However, it takes skillful collaboration to work across differences in power, scientific knowledge, land-use preferences, and traditional ecological knowledge (TEK).

That skillful transdisciplinary collaboration in everyday operations, or 'practice-transdisciplinarity', interested the authors as they sought to understand how an organization was reflective on its operational transdisciplinarity and what it looked like when that figured in its strategic planning. We define practice-transdisciplinarity as what Arnaud et al. (2018) celebrate as 'practical, discursive achievements', harnessing diverse knowledge, systems thinking, and reflective processes inside the organization's operations. Practice-transdisciplinarity is also a necessary lens for exposing and studying the organization's capabilities because 'revaluing of the ordinary skills and routines involved in micro-level activity is an important adjustment for disciplines which have too often abstracted to the remote level of "the firm" and similar' (Whittington, 2011: 184). We asked if leaders saw practice-transdisciplinarity, whether it was evident in their strategy design behavior, and whether they also considered it a strategic

differentiator, worthy of codifying in the organization's strategy. More specifically, we wondered:

1. What conditions would create this reflexive 'throughline' from practice-transdisciplinarity, to design, to their strategy product? It takes skillful collaboration to overcome differences (e.g., in power, resource-ownership, scientific knowledge and TEK) in operations, so how would those differences rise the level of 'advantage' to 'exploit' in strategy?
2. Aquaculture is critical to livelihoods, food security, and sustainability in Coastal Maine. What lessons could the Hub's case study offer to the economic development practitioners where their organizations must also exploit internal and external networks' knowledge to inform planning?

Using practice-transdisciplinarity as both a planning approach and a destination integrates science, policy and industry knowledge in a way that is both rigorous and inclusive. Practice-transdisciplinarity may provide an advantage for the strategic planning process as it improves the legitimacy of inputs (Cash et al., 2003), and improves the likelihood of the outcomes of that process being actionable because of their congruence with the organization's inherent mental models and capacities.

2. Literature review

This section addresses transdisciplinarity, practice-theory, and the connection between transdisciplinary research and practice-transdisciplinarity. Transdisciplinary research is an approach to science which honors and bridges different intellectual disciplines, and deliberately incorporates the perspectives of civil society (Lang et al., 2012; Jahn et al, 2012). Lang et al. (2012: 26) argued that transdisciplinarity goes even further to re-conceive social and scientific problems as being integrated together:

> Transdisciplinarity is a reflexive, integrative, method- driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge.

Transdisciplinary research can be a forcing function. In Rezaei's preface to his book 'Transdisciplinarity' (Rezaei, 2022: vii), he suggests that transdisciplinary research is a commitment, a position, a strategy 'to address prominent universal disagreements, complex

social, economic, public health, environmental and humanity issues, such as poverty, sustainability, public health, equality, justice and education.' Being willing to address universal disagreements is not about abdication from disciplines, but holding fast to the integrity of each incorporated discipline. Jahn and colleagues (2012: 5) state this clearly:

> [W]hile transdisciplinarity sets the frame for a research dynamic that couples societal and scientific progress, interdisciplinarity is the science-driven process of generating the new knowledge that fuels this progress.

Research and theorizing over two decades has shown that transdisciplinary research encompasses many collaboration strategies, such as non-linear, or systems thinking (Kish et al., 2021; McGinnis and Ostrom, 2013), co-creation of shared language (Clark, et al., 2016), roles focused on boundary-spanning (Guston, 2001; Clark et al., 2016), a quest for diversity in ways of knowing (Bruner, 1990), a reconciliation or juxtaposition of multiple scales of engagement (Clark & Hartley, 2020), knowledge and insight co-production (Lang, 2012), double loop learning or reflexivity (Lawrence et al., 2023), and, ultimately, the responsibility to know self and others enough to engage in intervention (Stokols, 2006; Lawrence et al., 2013). Rezeai (2022) notes that these transdisciplinary research collaboration strategies are inhabited by the principles of empathy, pluralism, and multilinguality.

In turn, these transdisciplinary research strategies may inhabit the business practices in day-to-day practice-transdisciplinarity. Pugh (2022) found three practice-transdisciplinarity operating categories that embody the transdisciplinary research strategies: network mindset, productive conversation, and strategic thinking (Table 1, and expanded below).

Transdisciplinary research is a model familiar to many scholars. But what of the people from multiple professional disciplines who collaborate to keep the business running? Practice theory can provide a useful lens for this. Arnaud and colleagues (2018: 693) define practice theory as a means to 'reposition work, processes and activities at the center of organizational analysis…while focusing on practice as a way to understand "organization as it happens." ' Whittington advocates for the practice-theoretic lens because it blends individual agency which is emergent, tacit, and embodied with a 'social essence that is irreducible to the psychological or biological' (Whittington, 2011: 185). Whittington goes on to assert:

> This mutual learning [across professional disciplines] will be facilitated by a disciplined focus on social practices and a respect for common themes. If we are disciplined in this

way, we can use practice theory to build a transdisciplinary project that is both wide-reaching and intellectually robust (2011: 185).

Table 1: Extending transdisciplinary research (TR) into practice-transdisciplinarity (PT): three PT operating categories

PT Operating Category	TR strategies (Pugh, 2022):	References
Network mindset	Incorporation of civil society and researchers	Lang et al., 2012; Jahn et al, 2012.
	Boundary-spanning	Guston, 2001; Clark et al., 2016; Galinsky et al., 2015; Page, 2008
	Operation on multiple scales	Clark & Hartley, 2020
Productive conversation	Shared language (for boundary crossing)	Clark, et al., 2016b
	Diversity in ways of knowing	Bruner, 1990
	Knowledge co-production	Lang, 2012
Strategic thinking	Systems thinking	McGinnis & Ostrom, 2014; Kish et al., 2021.
	Reflexivity	Lawrence et al., 2023
	Intervention	Stokols, 2006; Lawrence et al., 2013

Source: Pugh, 2022: 43.

Via practice theory, we hold ourselves accountable for considering transdisciplinary research concepts in the emergence of practice-transdisciplinarity. We can see practice-transdisciplinarity in such activities as meetings with stakeholders, business-development, new product development, and, most notably for our research, *strategic planning*. Below we elaborate on each of the three operating categories of practice-transdisciplinarity.

2.1   Network mindset

The network mindset category of practice-transdisciplinarity uses the transdisciplinary research strategies of incorporation of civil society and researchers, roles focused on boundary-spanning, and reconciliation or juxtaposition of multiple scales of engagement. Having a network mindset means holding a perspective that vital ideas come from the collective, and the network can discover, amplify and create them (Ehrlichman, 2021). Networks span the boundaries across professional disciplines, such as research, industry regulation, economic development, and food security. Differences in heuristics, perspectives and interpretations that come with those different ways of knowing, in turn, improve the organization's ability to generate options, execute, and recall (Galinsky et al., 2015; Page, 2008). Incorporating different ways of knowing can be a source of network legitimacy and productivity, alike (Freitag, 2014). For example, indigenous knowledge systems and TEK blend intuition, norms, and perception. Daigle and colleagues (2019: 783) capture this with the Passamaquoddy word for place-based decision making, 'Menakatoluhkatomon' or 'We move together'.

Practically speaking, for practice-transdisciplinarity, networks can accomplish a variety of outcomes, such as to channel a group's energy toward economic outputs (e.g., sustainability solutions), to support members' problem-solving (e.g., by comparing experiences), or to assemble leverage through their numbers (e.g., joint buying). For most network objectives, networks require diligent facilitation and engagement to get those outcomes (Pugh & Prusak, 2013; Ehrlichman, 2021).

2.2   Productive conversation

The productive conversation category of practice-transdisciplinarity uses the transdisciplinary research strategies of co-creation of shared language (for boundary crossing), a quest for diversity in ways of knowing, and knowledge and insight co-production. Productive conversation comes from the research on dialogue. Dialogue is a form of human interaction where participants welcome and respect diverse perspectives, carry a readiness to hear others' truths, bring willingness to examine one's own thinking, and commit to generating a collective intelligence (Dixon, 2021). However, dialogue is only part of the conversational needs of the organization, particularly where conversations span time and space, or where people come in and out. Skifstad and Pugh (2014) asserted that when dialogue also includes idea-translation and explicit inclusion, it is called *productive conversation*. In productive conversation knowledge, intent, meaning and shared value are cultivated intentionally.

Pugh & Altmann (2024) describe the five discussion disciplines that make up productive conversation. To the practices of dialogue (Isaacs, 1999), were added the disciplines of deliberate

acknowledgement (to individuals, groups, movements) and summarization (nonjudgmental upleveling and synthesis in order to propel the group forward). The resultant five discussion disciplines are the rhetorical intents of the speakers (or writers, in the case of online discussions):

1. Integrity: the act of making statements: 'The reason we are considering this is…' or 'We should…The point was…'
2. Integrity Q: the act of inquiring: 'What are…? How is…? Please can you help me understand…?'
3. Courtesy: the act of being positive, kind, and respectful: 'These are great examples…This gets better with practice…'
4. Inclusion: the act of acknowledging, bringing in: 'Preeti, as you said…Ahmed, can you share your perspective on…? Let's hear from someone who hasn't spoken…'
5. Translation: the act of synthesizing, extrapolating, or summarizing: 'On the one hand…on the other hand…We can look at this puzzle together…We can hold divergent views out there and look at them together. This is what we can agree upon and this is where we disagree….'

A sixth, Snarky, rhetorical intent, is the opposite of each of the five. Snarky reduces shared meaning and/or relationships. It could entail hyperbole or innuendo, insincerity, negativity, disrespect, exclusion, or a type of abstraction that is exclusive and/or self-sealing.

Each utterance in conversation can be coded as one or more discussion disciplines. Each discussion discipline in an utterance is called a move. In Pugh and colleagues (2023), which paralleled the Hub strategy-development program, we hand-coded approximately 1,100 moves (utterances-parts reflecting one discussion-discipline). These came from seven aquaculture-related town hall-like community meetings, and four similar unfacilitated conversations. We used these training data to train a large language model (LLM), the Bi-directional Encoding Representations from Transformers (BERT). (BERT is the ancestor of ChatGPT, which has fewer parameters than ChatGPT.) We then used that LLM on 23,000 open-source utterances, and then measured in a statistically significant manner the impacts of each discussion discipline on three outcomes: options-generation, intent-to-act, and relationship-building (Pugh et al., 2023). Using big, open data to run our model, we found that a 10% increase in the share of Inclusion or Courtesy increased the likelihood that the conversation would show evidence of Intent-to-Act by 45% and 35%, respectively. Productive conversation analysis corroborated what social scientists have shown about observability (Rand et al., 2014) and psychological safety (Edmondson & Lei, 2014): the more observable you are, the more likely you are to make public commitments to act; and the more psychologically safe you are, the more likely you are to make public commitments to act. The large language model research paralleling the study of transdisciplinarity in the

Maine Aquaculture Hub served as a benchmark of naturally-occurring distributions of discussion disciplines and outcomes.

2.3   Strategic thinking

The strategic thinking category of practice-transdisciplinarity uses the transdisciplinary research strategies of non-linear, or 'systems' thinking, double loop learning or reflexivity, and the responsibility to know the system of self and others enough to engage in intervention. Strategic thinking practices channel mission-articulation, inquiry, story, and systems thinking into the strategy development process (Liedtke, 1998). Liedtke (1998) argued that strategic thinking was a counterweight to strategic *planning*, which risks becoming a technical exercise, being less about ideation and integration, and more about quantification and (re)sequencing.

Strategic thinking practices are 'intent-focused' (being purpose-led), 'hypothesis-driven' (inquiring with data), 'thinking-in-time' (using analogies), 'systems perspective' (being interdependency-focused), and 'intelligent opportunism' (projecting the organization's capabilities forward) (Liedtke, 1998). These five practices are typical of a successful project team who must be tolerant of ambiguity, be respectful of both heritage and outside perspectives, and be skilled at sense-making (Gratton & Erickson, 2007). Strategic thinking uses imagination and engages in possibility-development, while it brings the whole system into the planning conversation (Moon, 2013). For a sustainability-oriented organization, strategic thinking can help to articulate social-ecological dilemmas, reflect on analogies across domains, generate options, and use data to inform pathways to achieving goals.

3. Research methodology

Over 1,100 Maine residents participated in the aquaculture industry in 2020, and the industry has been identified as a source of innovation and job growth for the Maine economy (Haines et al., 2020), with a year-over-year growth of 19%. It has been heralded as improving trade balance for the USA, producing food security, and creating a net improvement in wild fish weight around farms (Zajicek et al., 2021, Johnson, H., 2020). Yet, stakeholders must negotiate sometimes mutually-incompatible positions on aesthetics, food security, biodiversity, climate change, commercial and recreational craft navigation, and even the legitimacy of aquaculture (Zajicek et al., 2021; Cotton et al., 2023).

It is in this context that the Maine Aquaculture Hub emerged, a United States National Oceanographic and Atmospheric Association (NOAA)-funded initiative for educating the public

about aquaculture and advancing open science through training, research, and grants. The Hub had a sector-wide reputation as neutral, even amid widespread disagreement about aquaculture's role in the Maine economy. Established in 2019, the Hub's mission was 'to create a statewide, transdisciplinary collaboration…[and] focus collective efforts to build capacity for industry-driven innovation, diversification, and workforce development in Maine's aquaculture sector' (Hub Grant offering Letter of Interest, 2020). At the time of the study, the Hub fostered individual, organizational, and public aquaculture education through training, grants, and an industry roadmap. The Hub considered its stakeholders to be aquaculture farmers, equipment suppliers, harbormasters, researchers, regulators, investors, landowners, and consumers.

From July 2021 to February 2022, the Hub Core Team conducted a strategic planning process to consider the Hub's scope and positioning. At this time, the field of aquaculture-related research and aquaculture workforce development agencies and nonprofits was crowded, with approximately 25 entities vying for share of mind. Our research consisted of interviews, social network analysis, coding and analysis of meeting transcripts, and industry research. The Core Team member affiliations consisted of Maine Sea Grant (the Hub's parent organization, funded by the US National Oceanographic and Atmospheric Association), the Maine Aquaculture Association (an aquaculture industry trade organization), Coastal Enterprises, Inc. (a nonprofit community investment/development organization), the Maine Aquaculture Innovation Center (a research sponsor/facilitator focused on technology transfer and commercialization), and the University of Maine Aquaculture Research Institute (a university-based research center). The Coordinator of the Hub, an employee of Maine Sea Grant, was a former international marine scientist.

The Hub Core Team engaged in the strategy process to determine how the Hub might adapt as new, competing aquaculture education organizations emerged, special interest groups contributed to polarization, and diversity issues loomed, all against the backdrop of a warming Gulf of Maine. The Core Team was animated by three questions: 'Where should we play in the aquaculture sector?', 'How can we differentiate what we do?' and 'How can we continue over time with limited resources?' The strategy process involved industry analysis, two Core Team meetings, options-development, and action-planning.

Our research inquired into practice-transdisciplinarity in the day-to-day operations of the Hub. We also observed practice-transdisciplinarity in the Core Team's strategy process interactions. We evaluated three practice-transdisciplinarity features: network mindset, productive conversation, and strategic thinking. First, we conducted interviews to surface accomplishments, headwinds, opportunities, and perceptions of the Hub's strengths. Second, we transcribed two of

the Core Team's strategic planning conversations, 'Conversation 1: Strategy initiation' and 'Conversation 2: Options evaluation.' We coded each conversation move (sub-utterance classifiable as a discussion discipline) for the five discussion disciplines (rhetorical intent), and also coded the conversations for the presence or absence of strategic thinking practices. Conversation 1 had 140 moves (some utterances were more than one move). Conversation 2 had 75 moves. Third, we observed the Hub's operations, including network-convening, using observation and social network analysis. We incorporated our own experiences of strategic planning, transdisciplinary research, and aquaculture.

We used the parallel study of aquaculture community town halls, or 'lease scoping sessions' (Pugh et al., 2023). The discussion discipline proportions of those town halls served as a benchmark against which we assessed the discussion discipline proportions in the Hub Core Team conversations. We compared distributions of the discussion disciplines found in the two Hub Core Team conversations to the distributions of the discussion disciplines in the 745 moves across seven aquaculture community town halls. The variance from the aquaculture community benchmark was used to understand conditions where the Hub Core Team's actions may be spurred or stalled, creativity expanded or quelched, or relationships expanded or stunted.

4. Findings

Since its inception in 2019, the Hub has used practice-transdisciplinarity to convene and educate citizens in the diverse, and sometimes politically-fraught, aquaculture sector. However, the Core Team's framing of this was inchoate. In the interviews, the Core Team expressed that it was familiar with transdisciplinary research, and even had it in their mission statement. But Core Team members lacked a common understanding of how transdisciplinary research worked on an operational level as practice-transdisciplinarity. During strategy development, this awareness changed. The Core Team appeared to translate the Hub's practice-transdisciplinarity, namely its network mindset, productive conversation capacity and its strategic thinking capacity, into both its named competitive advantage and its strategy-process. Once an implicit part of the Hub's operations, practice-transdisciplinarity became a lens for reflection and design (Lawrence, 2023).

4.1 Network mindset as practice-transdisciplinarity and strategy process
In the Core Team's interviews, they explained that Maine aquaculture had significant headwinds, such as supply chain gaps, consumer misunderstandings, and tensions between farmers, riparian landowners and Native American fishers using TEK. Tensions created silos, or, in social network analysis (SNA) terms, self-reinforcing clusters. One Core Team member put it bluntly,

'Communities are in conflict. They have not come together on their vision for aquaculture.'
Another pointed to competition among agencies like the Hub: 'There are overlaps between
[aquaculture] workforce development programs.'

Despite this background, the Hub was adept at bridging across segments of the sector. Since its
inception, the Hub had connected aquaculture farmers, biologists, and regulators, and leaned into
multidisciplinary methods, language, and love for Maine. The Hub's activities, like the AQSW,
were a safe space for people interested in the aquaculture sector to learn next to each other. The
activities also contributed to the loyalty of the Hub's volunteers, including aquaculture farmers,
community leaders and researchers. In 2022, the Hub interacted with 105 unique organizations,
in 12 different convenings. In addition, 80 individuals had participated in AQSW training
programs during that time.

A Core Team member explained that the network mindset was an advantage worth exploiting,
'We bring people in the aquaculture space together. We [listen to] many voices…[W]e've been
getting to know the municipalities and AQSW students.' Another added, 'The Hub is also this
connection between hundreds [of] start up companies.' Core team interviewees believed that
these ties were stronger because of the Hub's real-time interactions (AQSW classes, focus
groups, or 1:1s), which benefited from the Hub's adept facilitation. In addition to being a central
component of the strategy, the network mindset was a resource leveraged in the two strategy
conversations: Core Team members drew in insight from outside the conversation, and engaged
in pattern-finding. Noted one Core Team member, while watching the Core Team's strategy
discussions, so rich with narratives from inside and outside the sector: 'We have a wider lens on
the industry. We've been able to see the common threads.'

4.2 Productive conversation as practice-transdisciplinarity and strategy process

When conversation participants suspend judgment and invite different perspectives, idea-
generation and problem-solving improve (Page, 2008; Dixon, 2018). Our parallel research on
conversation in the aquaculture industry showed direct correlations from the discussion-
discipline-shares to outcomes. For example, we found that the shares of Integrity-Q and
Translation correlated with Options-Generation, that Inclusion correlated with Intent-to-Act, and
that Courtesy correlated with Relationship-Building (Pugh, 2022; Pugh et al., 2023).

Core Team members saw productive conversation as fundamental to the Hub's brand. One
stated, 'The Hub is a safe place to have difficult conversations.' That member went on to suggest
that the Hub uses conversation skills in each of its offerings, namely AQSW training events, re-

granting, and the focus groups. Conversation capacity, in real time and in asynchronous communications, had contributed to its sector-wide reputation as being neutral.

We wondered if these patterns would be evident in the Core Team's strategy conversation, and if percentages of the discussion disciplines would match up with the strategy-process tasks of generating options and inspiring accountability. As described above, we transcribed and analyzed the Core Team's 'Strategy initiation' and 'Options evaluation' conversations. We coded each for the five discussion disciplines. Table 2 juxtaposes the two strategy conversations with each other, and with our aquaculture industry benchmark.

Table 2: Hub Core Team conversation transcript analysis showing outcomes correlated with those discussion discipline shared in the reference research (right)

Discussion Discipline*	Reference Transcripts %	Conversation 1 "Strategy Initiation"	Conversation 2 "Options Evaluation"	
Integrity ("We could jump to another level of productivity")	52%	44%	39%	
Integrity-Q ("Are regulators included?")	15%	(20%)	(20%)	**Options-generation**
Courtesy ("You have done an amazing job on all of this.")	12%	7%	(14%)	**Relationship-Building**
Inclusion ("[Name]. do you have anything to add?")	11%	(8%)	(4%)	(Intent-to-Act)
Translation ("Despite [those] different missions, we work together.")	6%	(19%)	(18%)	**Options-generation**
Anti/Snarky ("X is banging his head against the wall.")	6%	1%	4%	

——— = more than benchmark. – – = less than benchmark.

Note: Conversation 1 had 140 moves. Conversation 2 had 75 moves. (In each, some utterances contained more than one move). Aquaculture reference transcripts had 745 moves. Outcome types (right, outside the table) and Reference Transcripts (Column 2) are based on aquaculture conversation modeling (Pugh et al., 2023). *Discussion disciplines are Integrity (statements); Integrity Q (inquiry); Courtesy (positivity, respect); Inclusion (acknowledgement); Translation (synthesis, extrapolation); Snarky (sarcasm, indirection, insincerity). Green circles represent a positive outcome, relative to the benchmark. Red circle represents a negative outcome, relative to the benchmark. Columns may not sum to 100% due to rounding.
Source: Authors.

Was the conversation conducive to strategy-generation? The higher-than-benchmark Integrity Q (inquiry) and Translation (synthesis), indicated that the conversation was likely to generate options. The increase in Courtesy between Conversation 1 and 2 indicated that the conversation was likely to deepen relationships. Indeed, psychological safety appeared to have enabled members to try on novel business models. One Core Team member noted, 'The Core Team respects each other's interests. We are moving collectively forward.'

However, consider the conversations' percentages of Inclusion (acknowledgement) in Table 2. Neither conversation was high in Inclusion, relative to the benchmark (8% and 4% for Conversations 1 and 2, respectively, compared to a benchmark of 11%), and more moves were Translation (synthesis). It is possible that low Inclusion was associated with lower Intent-to-Act in the conversations. Low Intent-to-Act may have also resulted in the long time-gap between Conversation 1 and Conversation 2, and between Conversation 2 and the Core Team's strategy ratification.

4.3   Strategic thinking as practice-transdisciplinarity and strategy process

When we coded and analyzed conversation content for the Core Team, we also saw evidence of the Core Team's strategic thinking practices, namely their proclivity to generate a shared intent,

Table 3: Strategic thinking practices from the Core Team's conversations

Strategic thinking practice	Definition	Statement in Hub strategy conversation
Intent-focused	Being mission-affirming, combining energy and direction	'Shared waters is the DNA of the Hub.'
Hypothesis-driven	Using data-informed propositions, combining imagination and data	'There are a lot of others in this space, so I ask myself about where we can have an impact.'
Thinking-in-time	Using analogies, respecting the past and peers, but leaning toward the future	'It's useful to see who is doing things, for example [peer organizations]…This isn't exhaustive, but it's useful to think about who's in this sector.'
Systems perspective	Having an interdependency-focus, attending to heterogeneous elements, like talent, revenue, politics, nature.	'[We considered] the importance of fisheries and aquaculture *both* for the economy. The elements got broader as we were thinking them through. I don't know if others had thought that. It was a bit of a shift.'
Intelligent opportunism	Iteratively pivoting and projecting capabilities forward	'[The Hub has] the reputation of the different entities and the people who work for them. We have years of experience. People see that, understand it, and respect it.'

Note: Examples of strategic thinking practice by the Core Team during the strategy meetings. Definitions adapted from Liedke (1998). Source: Authors

Table 4: Progression of strategic thinking frequency at two strategy meetings

Conversation 1: Strategy initiation

Moves with Strategic Thinking	1 Systems perspective	2 Intent-focused	3 Thinking-in-time	4 Intelligent opportunism	5 Hypothesis-driven
#1-20 (11)	30%	10%	10%	30%	20%
#21-40 (6)	0%	0%	17%	50%	33%
#41-60 (4)	0%	75%	0%	25%	0%
#61-80 (3)	0%	0%	33%	67%	0%
#81-100 (10)	0%	30%	20%	50%	0%
#100-120 (10)	0%	18%	27%	45%	9%
#121-133 (10)	10%	20%	0%	30%	40%
% total	**6%**	**22%**	**15%**	**42%**	**15%**

Conversation 2: Options evaluation

Moves with Strategic Thinking	1 Intent-focused	2 Hypothesis-driven	3 Thinking- in-time	4 Systems perspective	5 Intelligent opportunism	Other**
#1-20 (7)	**14%***	43%	14%	14%	14%	0%
#21-40 (4)	0%	25%	25%	0%	50%	0%
#41-60 (5)	20%	20%	60%	0%	0%	0%
#61-80 (8)	13%	38%	25%	0%	25%	0%
#81-100 (7)	43%	14%	43%	0%	0%	0%
#100-120 (5)	0%	0%	0%	40%	40%	20%
#121-133 (8)	13%	13%	0%	0%	50%	25%
% total	**15%**	**22%**	**24%**	**8%**	**26%**	**6%**

Note: Table 4 shows the strategic thinking evolution chronologically (numbered 1-5 in row 1) in each conversation. Moves are represented in rows, in groups of ten. The number of moves which contain strategic thinking are in parenthesis in Column 1. Percentages indicate the share of the moves in the row identified as the specific strategic thinking practice. (For example, in Conversation 2, for the row containing utterances #100-120, there were five moves. Two moves were systems perspective, two intelligent opportunism, and one was Other. Cells have moderate shading if 2 or more utterances contain the strategic thinking practice. Cells are shaded dark if three or more utterances contain the strategic thinking practice. This shows a progression from upper left to lower right.

*A close reading of the text showed that, in the first five moves in Conversation 2, intent-focus emphatically led, though not in number of utterances.

** 'Other' was 'anti-hypothesis driven' where a speaker spoke out of certainty, contrasting to other hypothesis-driven moves which involved conjecture.

Source: Authors

to use far-ranging stories and analogies, to pose testable hypotheses, and to consider exploiting its strengths. Table 3 provides examples of the Hub's strategic thinking practices.

In Conversation 1, 41% (54 out of 133) of the conversation moves were strategic thinking. In Conversation 2, this climbed to 62% (44 out of 71 moves). What this means is that more utterances directly contributed to the strategy content. Strategic thinking practices may have come naturally to the members, yet it appeared that they were amplified when Core Team leaders discussed the practice-transdisciplinarity of the Hub in Conversation 2. Table 4 sequences the strategic thinking practices by frequency in ten-move intervals.

In Conversation 1, the Core Team first focused on the broad landscape (systems perspective), channeled a shared direction (intent-focused), pulled in analogies and stories (thinking-in-time), surfaced strengths (intelligent opportunism), and then, finally, imagined data, options and evidence (hypothesis-driven). The Core Team set the stage for the next activity by emphasizing strengths (intelligent opportunism). Conversation 1 appeared to have few hypothesis-driven strategic thinking practices, in contrast to Conversation 2. In Conversation 2, we saw roughly equal amounts of strategic thinking moves that were related to practical knowledge: hypothesis-driven (data-driven proposals), intelligent opportunism (leaning into strengths), and thinking-in-time (sharing narratives, discussing peers). In Conversation 2, the Core Team generated options (hypothesis-driven) and shared references (thinking-in-time), and then narrowed the aperture to extrapolate forward with intelligent opportunism. We established that conversation analysis and strategic thinking analyses are complementary. During Conversation 1, thinking-in-time frequently was associated with the Courtesy discussion discipline. To bring each option to life, the Core Team used a one-page mock 'brochure' of the future-state Hub. These fleshed-out futures paid homage to peers and other industries, and focused the Core Team's imagination. Such a vibrant illustration of target customers, services, and partners also pushed them to ask, 'Could that work for us?' shifting to the hypothesis-driven strategic thinking practice.

Overall, intelligent opportunism dominated both conversations, at approximately twice the frequency of the other practices in Conversation 1, and 10% more than the next highest, thinking-in-time, in Conversation 2. Meanwhile, the systems perspective appeared in both conversations at a percentage lower than the other practices. In our research, the inclusion discussion discipline (acknowledgement) coincided with the systems perspective strategic thinking practice (interdependency). Just as the Core Team's inclusion share was below the benchmark data so, too, the systems perspective was the least frequent strategic thinking practice. Our conversation analytics research showed that inclusion can deepen intent-to-act as acknowledgement brings people more fully into the conversation (Pugh et al., 2023). We asked

ourselves, 'How might this relatively lower inclusion/systems perspective combination have affected the strategy process?' Was there too little inclusion (direct acknowledgement) and too much politeness? A Core Team member shed light on this conjecture. They responded to a graphic of 'sliders' for trade-offs (e.g., research, versus commercial focus) and remarked, 'For some of our organizations, we are on different sides [of that graphic]. But we are in the middle when we come together.' A systems perspective might have been avoided, lest it incite a tense discussion about those different sides. If well-managed, such a discussion might have also led to new learning and shared pride in having pushed through the argument together. In our data, it appeared that the low systems perspective was twinned with low intent-to-act, just as inclusion had been shown to be associated with intent-to-act in our parallel research (Pugh et al., 2023). One could interpret this to mean that including different perspectives, either through the act of systems thinking or the act of drawing in a person with a different view, builds participants' sense of responsibility.

We established that strategic thinking is a practice that is adaptive. Core Team members could see that their ability to think together and persevere through shared goals, while integrating context, shared narratives, options and strengths, armed them for more resilient, reflective (non-reactive) collaboration. Thus, having practiced strategic thinking would come in handy in the Hub's future strategy-development as tensions in the aquaculture sector were inevitable. We believe that this practice was valuable, even despite proportionately lower inclusion and systems perspective.

5. Discussion: strategy and the practice-transdisciplinarity throughline
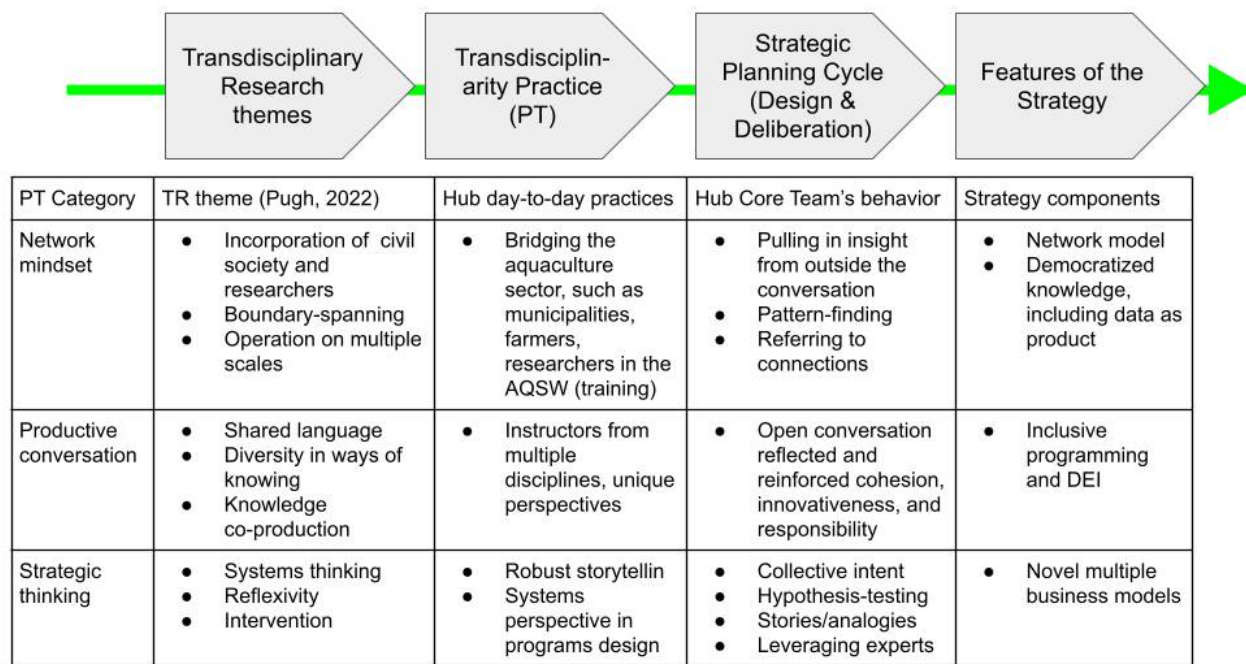
The practice-transdisciplinarity of the Hub provided the Core Team with evidence for considering bold changes. The practice-transdisciplinarity that surfaced in the Core Team during the strategy process enabled the Core Team to consider capitalizing on its network reach, breadth of (co)offerings, and diversity of constituents. Network now figures prominently in its model.

As researchers, we traced the Hub's operational boldness to having practice-transdisciplinarity inside the strategy-process, and then into the strategy itself (Figure 1). It appeared that novel strategic options came from:

- The confidence that comes with Hub's network mindset;
- The deliberativeness and transparency that comes from its productive conversation capacity; and
- The integration of analogies that comes from its strategic thinking capacity.

First, the Hub's day-to-day activities had involved a vast network of diverse beneficiaries from restaurants, to regulators, to researchers. The network concept inspired business model options. For example, a Core Team member contemplated income streams from fees, advertising, badging, competitions, and subscriptions, all drawn from peer organizations' strategies. Second, productive conversation skills observed in the strategy sessions were not just the unique talent of the Core Team, but reflected trust cultivated among the Hub's constituents, which resulted in participants asking for programming for specific segments like women in aquaculture. Third, strategic thinking practices also appeared to grow out of reflexive discussions of the Hub's intent-focus and intelligent opportunism. This reflexive habit helped with strategic options-development. For example, thinking-in-time 'muscles' resulted in more robust storytelling.

Figure 1: Transdisciplinarity-practive throughline

PT Category	TR theme (Pugh, 2022)	Hub day-to-day practices	Hub Core Team's behavior	Strategy components
Network mindset	• Incorporation of civil society and researchers • Boundary-spanning • Operation on multiple scales	• Bridging the aquaculture sector, such as municipalities, farmers, researchers in the AQSW (training)	• Pulling in insight from outside the conversation • Pattern-finding • Referring to connections	• Network model • Democratized knowledge, including data as product
Productive conversation	• Shared language • Diversity in ways of knowing • Knowledge co-production	• Instructors from multiple disciplines, unique perspectives	• Open conversation reflected and reinforced cohesion, innovativeness, and responsibility	• Inclusive programming and DEI
Strategic thinking	• Systems thinking • Reflexivity • Intervention	• Robust storytellin • Systems perspective in programs design	• Collective intent • Hypothesis-testing • Stories/analogies • Leveraging experts	• Novel multiple business models

Source: Authors

The distribution and timing of the discussion disciplines and strategic thinking practices across the conversations revealed the effects of practice-transdisciplinarity on the Core Team's cohesion, innovativeness and sense of inclusion. We observed that it was not just that they had good conversation, but that their conversation buttressed strategic thinking and the Hub Core Team's effectiveness. Conversation analysis provided a window into strategic thinking capacity, and some discussion disciplines dominated. Translation moves (with an associated 'intelligent opportunism' strategic thinking practice), may have helped keep the conversation moving. On

the other hand, if inclusion moves had been more frequent (with an associated systems perspective strategic Thinking practice), there might have been an earlier intent-to-act outcome.

Liedtke (1998: 125) explains that strategic thinking capacity must be learned: '[W]e must recognize three discrete aspects of the *process*: repertoire-building, managing the strategic issues agenda, and programming.' Even before the strategy conversations, the Hub Core Team could claim both programming (e.g., the next cycle of aquaculture training) and a strategic-issues agenda (e.g., the aquaculture industry Roadmap report). Yet, what Liedke calls 'repertoire-building' was new to the Core Team. To build repertoire, Liedke argues, leaders should become aware of their strategic thinking, such as skepticism (hypothesis-driven statements), or confidence (frequency of intelligent opportunism statements), or history-sharing (thinking-in-time statements). Leaders may under- or over-advocate for the mission (high frequency of intent-focused statements) and can be stymied by blind spots (low frequency of systems perspective statements). Our study of the discussion disciplines provided indicators of such strategic thinking imbalances.

Practice-transdisciplinarity for the Hub included a network mindset, productive conversation capacity, and strategic thinking, which, in turn, were assets in strategy-making. We witnessed the practice-transdisciplinarity capacities on three scales: social capital was spread over time/space (network mindset), dialogue occurred across diverse parties and interactions (productive conversation capacity), and strategy deliberations were unfettered for the Core Team (strategic thinking). How might practice-transdisciplinarity contribute to other organizations? First, practice-transdisciplinarity may be a latent strength for any organization's day to day operations. Second, surfacing and showcasing the best of practice-transdisciplinarity could provide both a role-model and evidence for the strategic planning process and product, respectively. In addition, when the organization has the option of composing its planning team, a practice-transdisciplinarity framework of network mindset, productive conversation, and strategic thinking could be criteria for selecting members or outside contributors.

6. Conclusions

The Hub's practice-transdisciplinarity capabilities that were exposed during strategic planning, namely network mindset, productive conversation and strategic thinking, had a throughline from practice, through strategy deliberation, through strategic options. Transdisciplinarity as strategy can be a model for imaginative and inclusive decision-making for organizations in industries like

aquaculture, which bring communities sustainability, food security, livelihoods and economic resilience.

We assert that economic institutions embarking on strategy-development with governments, non-governmental organizations (NGOs) and commercial entities should incorporate the three practice-transdisciplinarity categories, even if those capabilities are not currently strengths of the entities involved. The integrity and reflexivity of the transdisciplinarity as strategy (with its practice-transdisciplinarity throughline) appears to make strategy more bold, explicit, collective and evidence-based.

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An analytical framework for examining communities of practice in water management: a reflection on what they do and contribute to?

Laurent-Charles Tremblay Lévesque, Jeroen Warner, Jaime Hoogesteger, Gergana Majercakova and Nicolas Jarraud

Communities of practice (CoPs) have become a new water resource management paradigm. CoPs are highly regarded for promoting peer-to-peer knowledge sharing and collaboration, leading to better water management decisions and actions. Yet, the mechanisms through which CoPs operate, including what kind of learning is being pursued, for what, how, and by whom, are, however, often black-boxed. This research develops an analytical framework to understand better what water-related CoPs do and contribute to. The framework was co-developed, drawing from the experience of over 50 CoPs experts in water and environmental management. A series of preliminary discussions were held to identify existing frameworks that were then used to develop a draft skeleton of the analytical model. The framework was then tested and refined through interviews before being validated in a collaborative workshop. This paper details the developed three-block analytical framework—(i) context; (ii) processes (iii) outcomes—and uses examples from consulted water-related communities to illustrate its schematic components. Ultimately, this research aims to assist CoP coordinators in making more informed decisions about the design and maintenance of their water-related CoPs.

1.   Introduction

As the number of communities of practice (CoPs) in water management has recently skyrocketed, evidence seems to suggest that communities have become a new tool for many of the international organizations involved in water management. While they were typically established to promote knowledge sharing and peer learning (Page & Dilling, 2019), communities have been deployed to address an increasingly complex range of water governance challenges (Edelenbos & van Buuren, 2006). They are promoted to advance policy change, reduce conflicts, boost inter-organizational coordination, overcome sectoral

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and intercultural barriers, promote technology diffusion and innovation, and empower local voices and initiatives (Camacho, 2009; Cundill et al., 2015; de Groot et al., 2022). Although CoPs offer significant benefits, Vincent et al. (2018) caution against viewing them as a panacea for every challenge in water governance.

Beyond scoping the limits of what they can and cannot accomplish, there is also a need to critically reflect on how CoPs are designed and operate in the water domain (Fulgenzi et al., 2020). Existing frameworks on CoPs typically provide step-by-step guidance on establishing and maintaining community engagement (e.g., Catana et al., 2021; Eisenberg, 2018; Webber, 2016). However, only some are intended to understand their functioning in the context of water management, and even fewer offer insights into identifying the specific water governance advances they can bring. Consequently, those who design and maintain water-related CoPs often lack a clear analytical understanding of whether they are effectively set up to achieve their intended learning and governance change outcomes.

Drawing from contemporary social learning theories (Illeris, 2018), this research develops an empirically grounded analytical framework to examine the structuring characteristics of water CoPs. The framework provides a typology to discuss in further detail the various design and operational features that characterize the learning processes and outcomes associated with water CoPs. Ultimately, this framework aspires to become a tool for leaders and coordinators to reflect on their CoP design choices and guide them in making better informed and adapted decisions regarding establishing and maintaining their communities. This includes what kind of learning is needed, which aspects of experiential learning should be prioritized, who gets invited, how open the community is to newcomers, and how to monitor and evaluate the value(s) that a CoP generates.

Aligned with the generational framework of Knowledge Management for Sustainable Development (KM4SD) (Boyes et al, 2023), this paper underscores the need for a transition towards an integrative and systems-oriented approach to knowledge sharing and application (Cummings et al., 2019). The participatory design and development of this analytical framework reflects a commitment to co-creation, multi-stakeholder processes, and new knowledge partnerships, hallmarks of the KM4SD generational framework. Additionally, the focus on capturing and evaluating the tangible outcomes of CoPs from a bottom-up perspective, resonates with KM4SD's emphasis on identifying alternative discourses to how knowledge is being produced and used (Boyes et al., 2023).

This paper has five sections. Section 2 introduces the concept of CoPs and provides an overview of their presence in the water sector. Section 3 lays out the research objectives and the three-step methodology employed by this research. Section 4 presents the results and a detailed explanation of the framework, along with practical examples demonstrating how its various components can be applied to explain the range of design choices available to CoP

managers. Lastly, Section 5 explores the broader implications of this framework and suggests ways that CoP coordinators can use it as a checklist to guide their efforts. We conclude by examining the framework's limitations and outlining potential directions for future research.

2.   Communities of practice in water management

The term 'community of practice' was coined by Jean Lave and Etienne Wenger (1991) to describe the social learning processes associated to situated working environments. The term was later refined by Wenger and is now commonly defined as "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger-Trayner et al., 2023: 11). To distinguish CoPs from other collaborative groups and networks, such as multi-stakeholder platforms, living labs or task forces, Wenger (1999, 2011) developed a three-dimensional definition of CoPs (Figure 1), which has become the benchmark reference to determine whether a social group or network qualifies as a bona fide CoP (Mercieca, 2017; Sethi, 2017).

In the past two decades, international organizations involved in water management started realizing the potential of CoPs. They thus began establishing numerous communities to accelerate their work on specific water-related issues. Notable examples include the WMO CoP for Flood Forecasting and Warning[1]; the World Bank Water Communities,[2] and the Water and Open Government CoP[3] founded by SIWI, WRI, WIN, and Fundacion Avina. Additionally, GWP supports over 20 CoPs on various water management topics, such as transboundary water cooperation, gender and social inclusion, and SDG 6.5.1. implementation[4]. Besides, there are several networks and professional groups, albeit not formally called a 'Community of Practice' (e.g., the UNCCD Communities of Learning and Practice (CLPs)[5] or IWA's specialist groups[6]) that fit Wenger's analytical conceptualization for CoPs. Annex 1 presents selected examples from CoPs that were consulted in developing this analytical framework, which also gives a sense of the diversity of CoPs currently operating in the water space.

Academically, studies on CoPs have been conducted in almost every sub-sector of water management, e.g., in the WEFE (water-energy-food-ecosystems) Nexus (Mochizuki et al., 2021; Mohtar & Lawford, 2016; Smith et al., 2017) drought and climate variability adaptation (Dilling et al., 2022; Grainger et al., 2021; Kalafatis et al., 2015) and water service provision (Camacho, 2009; Carden et al., 2016). Given that the concept of CoPs originated from learning and educational sciences, a major research focus has been directed towards highlighting the contribution of CoPs in promoting peer-to-peer knowledge sharing and enhancing capacities among water professionals and decision makers (Attwater & Derry, 2005; Fulgenzi et al., 2020; Tran et al., 2018). Apart from bolstering knowledge and technical skills, researchers have also suggested that water-related CoPs can help bridge science and

policy (Iyalomhe et al., 2013) and foster cross-sectoral cooperation (Page & Dilling, 2019). Furthermore, CoPs can presumably trigger change at different scales; from transforming local water management practices (Joshi & Bhardwaj, 2015) and contributing to the development of national policy frameworks (Foster et al., 2019) to promoting the adoption of transboundary agreements (Timmerman et al., 2023).

Figure 1. Dimensions of CoPs (Source: Adapted from Wenger-Trayner et al. (2023)).

Since the literature on CoPs in the field of water management is more conceptual than empirically grounded, there is however a tendency to short-circuit the causal relationship between "what CoPs do?" (e.g., workshops, co-production of tools, prototyping) with "what do those activities produce?" (e.g., enhanced knowledge, trust building, new practices). This is gradually leading to the hyperinflation of the CoPs, which are now increasingly portrayed as a new one-size-fits-all solution for addressing water challenges (Vincent et al., 2018). As such, there is a need to analyze social learning processes further and identify practical measures to assess the contribution of CoPs in promoting social learning and sustainable water management.

3.   Research objectives and methodology

The objective of this research is to develop an empirically grounded analytical model that can be used to carefully unpack the functioning and contributions of CoPs in water management. This framework aims to serve as an investigative tool to explore why social learning has

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happened (and where it has not). In that sense, it can be used to understand the qualities of a CoP but also to identify its challenges and where community facilitators might get typically stuck. The framework was designed to respond to a series of key interrogations that CoP leaders and facilitators ask themselves while establishing and maintaining their water-related communities, including, but not limiting themselves to: In what way does the hydrological and social environment influence a CoP's learning agenda? What kind of knowledge is being pursued, how, and by/with whom? And what can we say about the possible contribution of CoPs to advancing water governance change?

To develop this analytical framework, we employed a three-step participatory process. The first step involved conducting a desktop literature review and engaging in discussions with water professionals and CoP experts to identify major frameworks addressing social learning in water management. We began by examining a wide range of learning models from the adaptive governance literature (e.g., Folke et al., 2005; Foxon et al., 2009; Berkes, 2017; Pahl-Wostl et. al., 2007a) and refined our selection based on insights from our discussions with experts. A key distinction emerged between frameworks that place social learning processes at the core of their conceptual model and those that treat learning as one of many processes underpinning socio-ecological system transformations. With this distinction in mind, we prioritized frameworks emphasizing "learning together how to do things better together" over those focused on "learning to adapt".

To identify a foundational working model, we organized a workshop session at Stockholm Water Week 2023 titled "Accelerating Governance Change through Social Innovation and Communities of Practice." This session brought together 52 water experts, many of whom worked on issues related to knowledge management, professional education, and capacity building. Through the workshop, we identified Bouwen and Taillieu's (2004) framework, "Multi-Party Collaboration for Social Learning in Natural Resources Management," as the most valuable conceptual roadmap for understanding how CoPs function and generate outcomes in the context of water management. On the one hand, roundtables discussions revealed that Bouwen and Taillieu's framework was found to be conceptually compelling for its clean three-block structural view on social learning, breaking it down to the context, process, and outcomes. On the other hand, however, the framework was shown to be lacking from two perspectives: first, for black boxing the social learning process as the use of 'facilitating mechanisms' applied to 'collaborative problem/task management' and; second, for reducing the outcomes to 'technical' and 'relational' qualities, thus disregarding other potential effects of a CoP, for instance, on policy or cognitive change.

As a second step, a draft of an improved analytical framework was developed before being tested and refined through a series of online interviews with 33 participants between March and June 2024 (Annex 2). Interviewed experts were identified via professional networks, a web search for water-related CoPs and then also through snowball referral, a proven method

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used for selecting practitioner interviewees (Parker et al., 2019). In terms of stakeholder type, 'intergovernmental organizations' were the most represented group with 13 representatives, followed in order by stakeholder representatives from 'university/research institutes' (7), 'private sector' (5), 'international organizations' (5) and 'governmental organizations' (4). Together, the interviewed experts represent the experience of over 30 CoPs in the water space. These CoPs are from various sub-sectors (e.g. transboundary management, nature-based solutions (NbS), disaster management, etc.) and operate in different regions and geographical scales (national, regional, and global), thus offering a representative sample of CoPs working in the field of water management.

Informed verbal consent was obtained from study participants prior to their participation. Interviews were transcribed using the Microsoft Teams Record and Transcription software. Transcripts were compared and checked against interview notes for correcting language inconsistencies and filling in minor grammatical gaps.

The interviews began with a general presentation of the framework followed by a discussion based on several open-ended questions to elicit reflection, drawing from the experience of the communities these experts were engaged with. This allowed us to test the analytical capacities of the framework by using each analytical block to reflect on how their CoPs are being organized and managed. It also allowed us to fact-check whether the analytical framework responded to the original objectives that motivated its creation. At the same time, these interviews allowed for drawing a rapid landscape assessment and identifying some dominant trends of CoPs in the water domain, e.g., in terms of the participatory approach adopted or preferred learning orientations, etc. Interview findings were cross-checked and triangulated with community or project documentation (e.g., CoP webpages and annual activity reports).

In the third step, the framework was validated through a participatory online workshop with 33 water professionals and CoP experts, 21 of whom had not participated in the interview consultations. A series of propositions were submitted for group discussion, including: does the framework (i) explain how the context can influence communities, (ii) allow to unpack the learning processes of CoPs, (iii) help clarify what are the specific kinds of contributions that CoPs can bring towards advancing sustainable water management? Workshop moderators synthesized the results of the group discussions. An online follow-up debriefing session was organized to discuss possible cross-references made under each schematic element of the framework and to validate findings.
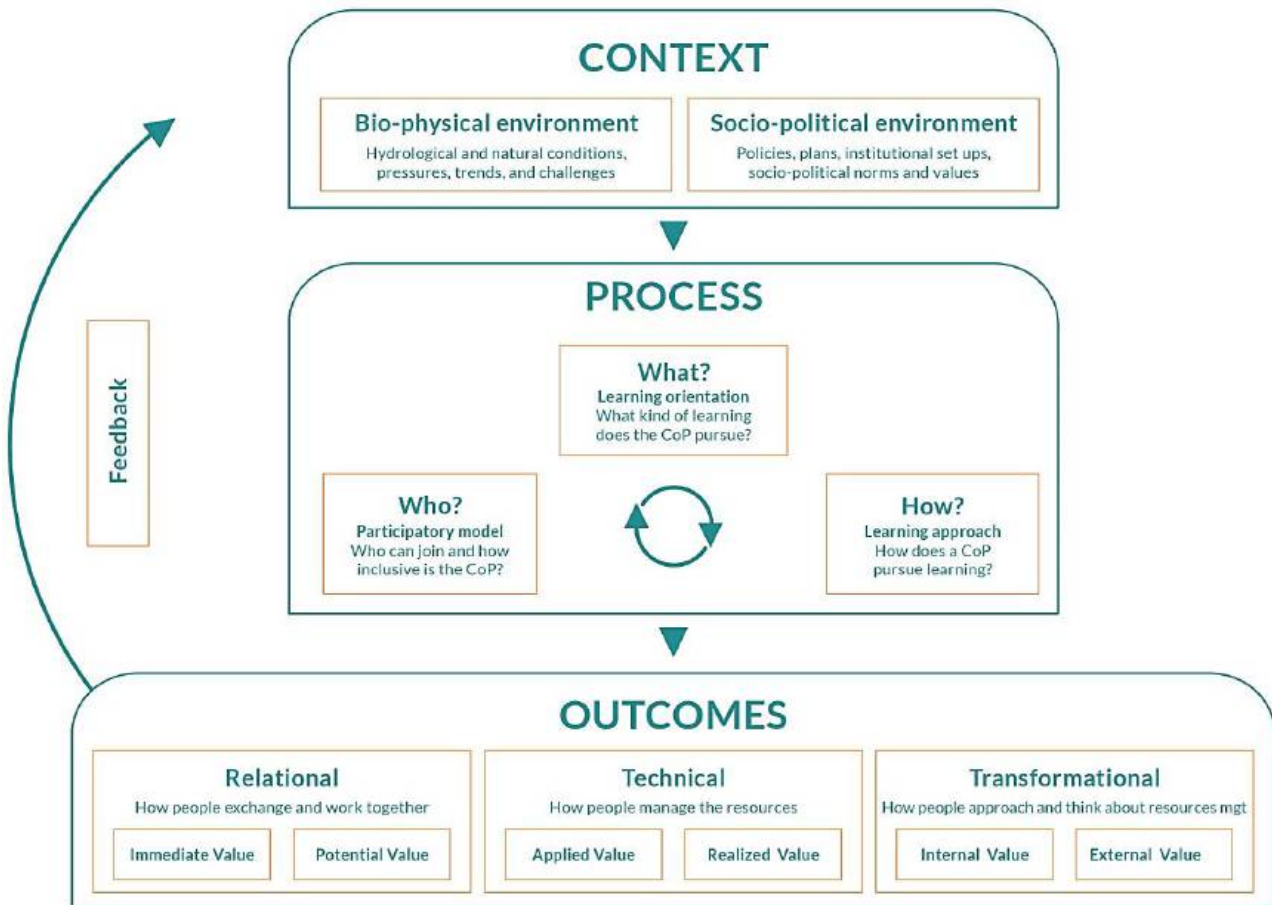
Figure 2. A Conceptual Framework on CoPs and Social Learning in Water Resources Management.

4. Results: a consolidated analytical framework

4.1. Organizational structure

The framework is built on Bouwen and Taillieu's (2004) cyclical model of multi-party collaboration and social learning for natural resources management, a widely applied framework used in environmental and water governance (see, e.g., (Mostert et al., 2007; Pahl-Wostl et al., 2007b; Pahl-Wostl & Hare, 2004; Tippett et al., 2005). Following Bouwen and Taillieu's original conceptualization, the framework proposed here is framed around a three-block skeleton of social learning: (i) context, (ii) process, and (iii) outcomes, which are interconnected by an iterative feedback loop (Figure 2). Since Bouwen and Taillieu's framework was noted to lack precision regarding the learning "processes" and "outcomes", we additionally incorporated four other known concepts and models from participatory environmental governance and social learning theory. Concerning the learning processes, we incorporated concepts from the learning loop model (Argyris, 1977, 2004; Argyris & Schon, 1992), experiential learning (Kolb, 1981, 2014), and legitimate peripheral participation (Lave & Wenger, 2001). The categorization of the learning outcomes in the framework presented

here is built on the Value Creation Framework (VCF) (Wenger-Trayner et al., 2020; Wenger et al., 2011). The following is a detailed description of the three main schematic blocks of the framework and the interactions between each of those elements.

4.2.   The context: how does the bio-physical and socio-political environment influence the CoP?

Social learning takes place within a context, and as Wenger argues: "communities of practice cannot be considered in isolation from the rest of the world or understood independently of other practices" (1999: 103). Following Bouwen and Taillieu's (2004) original model, our framework highlights the importance of beginning to unpack how a community operates by first looking into how it is influenced by the "bio-physical" and "socio-political" environment. These two contextual elements are embedded within the social learning processes, meaning that they will affect but also be affected by the learning dynamics and outcomes that CoPs generate (Pahl-Wostl et al., 2008).

As human and hydrological systems are inextricably coupled, the bio-physical conditions can have a considerable influence on people's perceptions and behaviours (Garcia et al., 2016). The state of the bio-physical environment can influence social learning by shaping what people think is a priority area that requires collective learning action. To give a simple illustration of this, a CoP dedicated to irrigation efficiency is unlikely to get traction in a country or region where freshwater is abundant–and vice versa insofar as water scarcity may push people to want to engage in a CoP dedicated to enhancing irrigation practices. As such, bio-physical conditions can be used as what Mostert et al. (2008) call "framing and reframing" processes, which can then play a significant role in setting the stage for the learning agenda pursued by a CoP. This includes areas within a 'domain' where learning is seen as important to pursue and where it is not.

Several interviewed community representatives noted a significant impact from the bio-physical context and hydrological conditions on their CoPs, particularly how disasters and hydro-climatic extremes events act as catalysts. Both the NbS in Water Management CoP[7] and the Central Asian CoP on the WEFE Nexus[8], for instance, saw a dramatic surge in the attendance of webinars, number of people applying to join the community, and in the online interactions as a result of the Slovenia floods of August 2023[9] (personal communication, participant 1, 22/03/2024) and in Kazakhstan in May 2024 (personal communication, participant 27, 06/05/2024). Similarly, the Technical Committee on Ice Research and Engineering[10] is becoming one of the most active IWHR communities[11], which is likely driven by the increasing awareness of glacier melt brought forth by recent glacial lake outburst flood events and images of receding icebergs (personal communication, participant 17, 19/04/2024).

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The social-political environment plays an equally important role in shaping the social learning process in environmental management (Keen et al., 2012; Pietz & Zeisler-Vralsted, 2021), and thus, in how a CoP works. CoPs that operate in domains where "societal-wide learning processes" (Bawden et al., 2007) are dynamic benefits from being able to tap existing social networks. This is true for communities such as the UNCCD CLP and the IDMP CoP[12], which can mobilize vast existing networks of researchers, community-based organisations, and governmental authorities already engaged in national and international forums such as the UNCCD Conference of Parties or the Drought Resilience +10 Conference. Moreover, as Bicchi (2022) argues that CoPs can use the policy frameworks to anchor their practice and legitimize their existence. The WEFE4MED[13] and the BONEX[14] Communities, for instance, benefit, from one side, from the EU's funding commitment towards supporting the implementation of the WEFE Nexus in the Mediterranean through the PRIMA programme (European Commission, 2024), and on the other, from UFM Water Policy Framework, which has a significant WEFE Nexus component (UfM, 2019). In theory, the absence of a policy framework–or one that runs contrary to the CoP's practice–could also inhibit the development of the community. Yet, none of the consulted CoPs representatives have shared examples where the social-politico environment played against them.
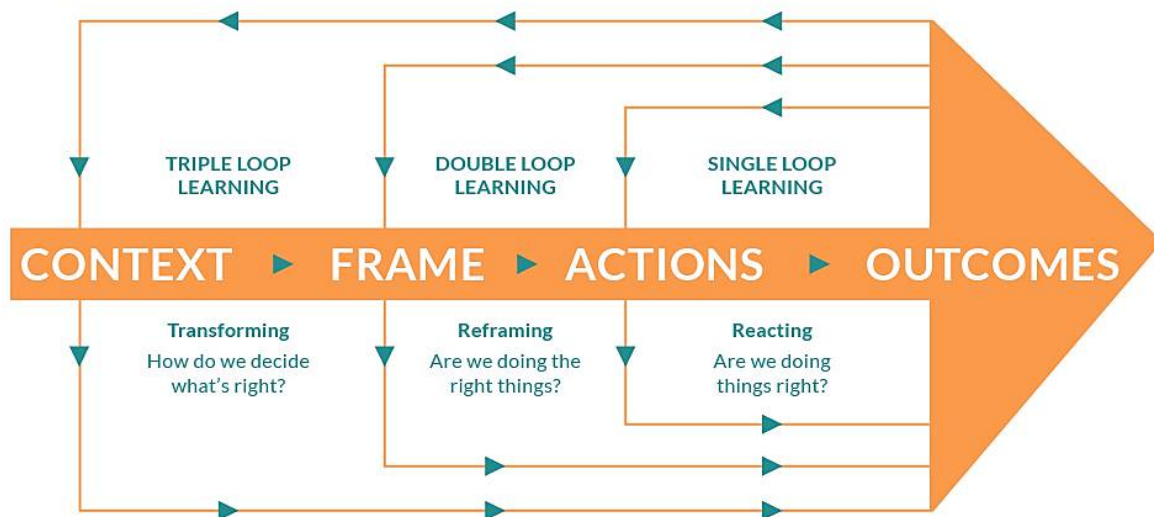

Figure 3. Learning Loop Model (Source: Adapted from Tamarack Institute (2017)).

4.3. The processes: learning about what, how, and with whom?

4.3.1. Learning orientation: what kind of learning does the CoP pursue?

The learning loop model can serve as a valuable framework for characterizing the different type(s) of learning that a CoP may wish to pursue (Argyris & Schon, 1992). We propose that a CoPs' learning orientation falls within three broad categories: "are we doing things right?" (single loop); "are we doing the right things?" (double loop); "how do we decide what's

right?" (triple loop learning) (Figure 3). While noting the differences between the three types of learning, multi- or triple-loop learning should not be considered superior to double or single-loop learning; they represent different learning orientations. The type of learning that a CoP wishes to pursue depends on the size of the community, the needs of the members, and relations among them, but also on the characteristics of the broader learning environment, i.a., the level of knowledge maturity of the domain and the nature of the CoPs working practice (Fuller et al., 2005).

As communities in water management often form around specific concrete technical and informational problems (Page & Dilling, 2019), unsurprisingly most of the consulted CoPs were predominantly geared towards single-loop learning. More than half of the CoPs leaders consulted built their community to serve as a 'help desk', where members can come with their problems and get tangible advice from their peers. In this light, one of the CoP coordinators argued that what "people crave is information that's actionable information and practical information that they can use to change the way they do business" (participant 10, personal communication 16/04/2024). Another consulted CoP expert also presented their community as one guided by a troubleshooting mandate focusing on "the application of the learning in the transformation of everyday work" (participant 30, 27/05/2024).

Besides, pursuing double and triple learning is only sometimes considered desirable or feasible. For instance, while the Global Water-Energy-Food (WEF) Nexus Community[15] aims to infuse double and triple-loop thinking in their training events and summer schools, their coordinators have also realized that focusing on more complicated and complex questions may lead to certain trade-offs: "often you find if you are too global or too transformational, you become too idealistic and lose relevance at the local level because you're a bit detached from the realities of things" (personal communication, participant 33, 11/06/2024). Similarly, another consulted community moderator shared that pursuing double or triple learning requires time and some level of trust between participants, which is something that is proven to be difficult, especially for virtual communities (Eggs, 2012). As a predominantly online community, the coordinators of this CoP were satisfied with the problem-fixing type of learning they have been able to pursue so far (personal communication, participant 1, 22/03/2024).

A smaller sub-set of communities have nevertheless been guided by an active pursuit of double and triple loop learning. In the WEFE4MED CoP, pre-launch community meetings focused on the unintended consequences of solar irrigation, which could be an example of double-loop learning. Many of the identified WEFE demonstrators look beyond the interconnection of the 'Water-Food-Energy-Ecosystems' Nexus and bring in other considerations, such as how the demonstrators link to topics of gender inequality or youth unemployment (WEFE4MED, 2024). The WEFE4MED community thus exemplifies a pursuit for triple-loop learning insofar as it is guided by a continued desire to be a space to

reflect on the usefulness and limitations of the current conceptualization of the WEFE Nexus
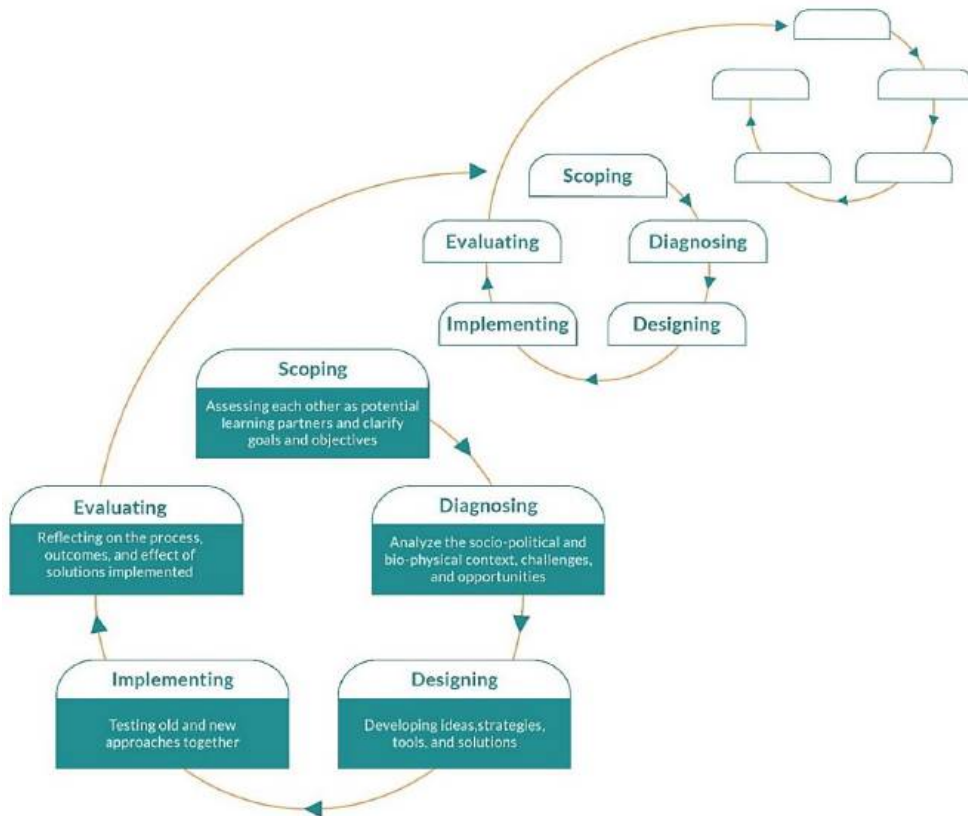approach and encourage its members to think beyond the 'WEFE-box'.

Figure 4. Experiential Learning in CoPs (Source: Adapted from Keen et al. (2012)).

4.3.2.   Learning approach: how does a CoP pursue learning?
One way of examining how a CoP pursues learning is to assess how much effort and energy
the community dedicates to each phase of the experiential learning cycle (Kolb, 1981, 2014).
Using the Keen et al. (2012) expanded version of the experiential learning model as a
reference (Figure 4), the cycle can be broken down into five elements or steps. To kick start
the social learning process, CoPs often carry out (i) 'scoping' activities to offer potential
members the chance to get to know each other and assess the degree to which they would
constitute good potential learning partners for each other. Typically, scoping happens parallel
to (ii) 'diagnosing', where members talk about "what keeps them up at night" and examine
the various dimensions of their shared problem or the facets of the opportunity they'd like to
explore jointly. Then comes a (iii) 'designing' phase, where members exchange possible
solutions and develop ideas and strategies to overcome the issues they have identified. As
the next step, CoPs can work on (iv) 'implementation' aspects, helping their members
experiment with new ways of doing and putting their ideas into practice. Finally, CoPs are a
space for (v) 'evaluation', allowing their members opportunities to reflect together on the

results of their newly employed solutions or revisited practices. CoPs tend to pursue experiential learning iteratively, using the learnings and momentum gained through one cycle to propel another (Kolb, 2014).

Depending on the community's learning orientation and needs, CoP managers can decide to spend more or less time on each phase or skip some phases. For instance, one could expect a community driven by single-loop learning to invest considerable efforts in 'diagnosing' and 'designing' together. In contrast, a CoP that aims for triple-loop learning may tend to favour activities focused on 'evaluating'. Most of the consulted communities dedicated more attention to the first three learning stands, partly by choice but mostly because of operational and budgetary constraints. More than three quarters of the consulted CoPs interacted mostly online with only occasional face-to-face engagements (e.g. UNCCD CLPs, IDMP CoP, World Bank Communities). As a result, they often decide to focus on 'scoping', 'diagnosing' and 'designing', and leave 'implementing' and 'evaluating' as something that members should do offline between community webinars or other online events. Also, even when there is face-to-face interaction, more than 80% of the consulted CoPs do not have field visits built into their programs, reducing prospects of seeing whether knowledge and tools gained (and hopefully applied) through the community create tangible change. At least half of the CoP managers consulted raised the importance of funding constraints as limiting their ability to do implementation/piloting and evaluation together.

The few communities that built their engagement around demonstration sites were better able to "close" the experiential learning loop and carry out activities that had a component of joint implementation and evaluation. One example is the BONEX community, which created a methodological tool called the WEFe Framework. This framework was iteratively developed and tested in seven carefully selected demonstration projects, representing a range of contexts, challenges, and technologies in the Mediterranean. The goal was to ensure that the results are genuinely replicable and account for the socio-ecological and cultural diversity of the Mediterranean region (BONEX, 2024). Another CoP that has a strong focus on the implementation and evaluation elements, is the WEFE4MED CoP, which has a twinning and mentoring program as well as study visits for demonstration site representatives to reflect together on the effects of their implemented WEFE pilot solutions (WEFE4MED, 2024).

4.3.3. Participatory model: who can join, and how inclusive is the CoP?
To fully unpack the learning process of a water CoP, one needs to additionally understand the membership model of a community and the degree to which it is welcoming to outsiders/newcomers. The community membership structure is guided by a set of formal and informal rules that regulate boundaries around "what does it take to qualify as a member?" and "how big should the community be?" (Wenger et al., 2002). Besides being dedicated to making a difference in shared areas of interest, CoP members can decide to restrict membership based on a certain list of eligibility criteria, such as coming from a specific

professional background, age, gender, geography, sector, institution, etc. (Wenger, 1999). For instance, some communities may require an organizational affiliation but also having reached a specific ranking in the management of that organization as a condition for membership eligibility (Ijjasz-Vasquez et al., 2024).

As for CoPs in general, there is no ideal membership structure or size for water-related communities. What matters is whether the number of members is consequent with the ambitions of the community and the difference it is trying to make (Wenger-Trayner & Wenger-Trayner, 2014). On the one hand, small communities foster close-knit relationships and deep engagement making it possible for members to know not only "who does what" but also "who knows what" (Wenger et al., 2002). The downside is that they may lack diverse viewpoints and be more limited in resources, something which can end up creating an 'echo chamber'. Some small communities also risk becoming overly exclusive, fostering a sense of elitism that can leave those outside the group feeling excluded or alienated (Gourlay, 2011). On the other hand, large communities can provide a wealth of knowledge and varied experiences. They are also typically better at creating connections with other communities and networks, thus promoting transdisciplinary thinking and approaches (Cundill et al., 2015). That said, large communities can risk becoming too generic, unwieldy to coordinate, and less personal.

The water-related communities that were consulted give a glimpse of the diversity regarding membership models in water CoPs. On the 'exclusive' end of the spectrum, there are small communities like AGUASAN[16], where members need to belong to a Swiss-based organization involved in water and development but cannot be from the private sector (participant 22, personal communication, 25.04.2024). Another example of a relatively small and exclusive community is the Armenian Drought Management Community[17], whose members primarily consist of experts from hydrometeorological and river basin authorities. Moreover, the online exchanges are conducted almost exclusively in Armenian, effectively limiting membership to Armenians (or at least Armenian speakers). At the other end of the spectrum, there are predominantly virtual CoPs open for anyone to join and have hundreds— if not thousands—of members, such as the NbS in Water Management, SDG IWRM, UNCCD, IWA, and SUSANA[18] communities. While specifying their target audience on the community registration page, these groups are technically open for anyone to join as long as the individual is willing to create an account on the CoP virtual platform. Somewhere in between are communities such as the Central Asian CoP on the WEFE Nexus, which require a separate application to be a member, whereby the applicant sends a note that is then screened by a moderator for background relevance before they decide to grant admission into the community formally[19].

Borrowing from the concept of legitimate peripheral participation (Lave & Wenger, 2001), it is also essential to consider the extent to which a community actively reaches beyond its

boundaries to engage and recruit individuals outside or on the periphery of its structures (Figure 5). Legitimate peripheral participation can take many forms, such as inviting newcomers to attend meetings to become familiar with key concepts or assigning straightforward tasks to introduce them to the community's practices (Campbell et al., 2009). CoPs in healthcare and education often utilize work-shadowing and mentoring programs as a means for newcomers to learn the ropes (Bottoms et al., 2020; Orsmond et al., 2022).

More than half of the consulted water-related community leaders have shared that they intentionally created opportunities for 'outsiders' and 'lurkers' to engage and become more active members. For instance, IAHR committee meetings, often held at major events like the IAHR world congresses and the flagship symposium of each specific technical committee, are typically open to all conference participants. Similarly, the UNCCD CLPs and the IDMP CoP have organize dozens of such events and mingles during major water conferences like the Stockholm World Water Week or the World Water Forum. This allows individuals who may have an interest but are not yet familiar with the community's work to engage and learn more about their activities. The Global WEF Nexus Community has been doing a podcast that purposely recruits early career nexus researchers instead of mobilizing the usual suspects. This approach helps this community welcome new members and brings fresh and diverse perspectives, enabling them to challenge existing theories and explore double and sometimes triple-loop learning. One of the plans for the WEFE4MED CoP is to start a mentoring and internship program for graduate students to learn from experienced practitioners and researchers.
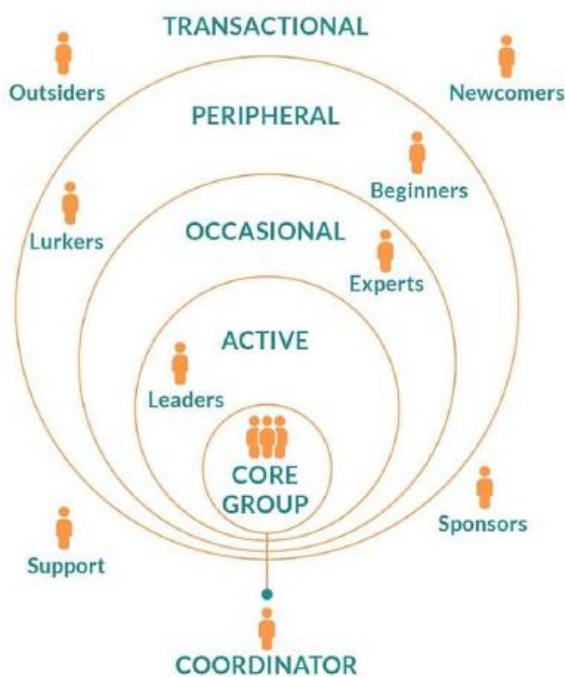

Figure 5. Community Structures and Boundaries (Source: GWP (2022)).

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Table 1. The Value Creation Framework (Source: Adapted from Wenger et al. (2011) and Wenger-Trayner (2017)).

Values		Description
Relational: Improving how people exchange and work together	**Immediate:** Your experience of engaging with the community.	This includes the direct value derived from activities and interactions such as meeting someone new with whom you share similar interests, having an insightful conversation, feeling valued and respected by peers, getting excited about what you are working on, etc.
	Potential: What you got out of it.	This highlights the value of learning from others, such as discovering new resources, tools, or tips relevant to your work. It also emphasizes the importance of feeling connected to a group and knowing that support is available from other members—for example, being able to ask questions, request information, or feel privileged access to knowledge through your group or platform.
Technical: Improving how people make decisions and actions to manage the resources	**Applied:** What did you do with it?	This value reflects how your practices have evolved due to the information and knowledge gained from the community or network you belong to. It could involve applying a recommended tool, reusing presentation slides, or adapting training exercises. It might also include experimenting with a new procedure based on a shared tip or pursuing a new collaboration with a fellow community member.
	Realized: The result of having applied it.	The realized value comes from the effect and achievements of adopting the newly applied practice. Performance improvements can be about increasing output or productivity, including saving time, but they can also be about avoiding mistakes, reducing overlaps, filling gaps, or resolving conflicts.
Transformative: Changing how people think and approach water management	**Internal:** The deeper effect it had on you and other CoP members.	The internal transformative value relates to changes in mindsets and perceptions the CoP generates for its members. This can reveal itself as a growth in the ability to speak confidently about an issue, a sense of agency, reconfiguration of personal identities, a new attitude or preference, etc.
	External: The broader societal effects are seen beyond the CoP structures.	External transformative value refers to how CoPs foster broader societal changes that redefine our measures of success. This can take the form of paradigm shifts, the creation of new policies, plans, or strategies, changes in collective behavior, shifts in moral or cultural values, or redistributions of power among groups and institutions.

4.4.   Outcomes: What values do water-related CoPs generate?

The analytical model presented in this study builds on the VCF framework to categorize the various effects that a water-related CoP can produce. As originally developed by Wenger et al., (2011), the VCF identifies five types of values generated by CoPs. First, CoPs produce "immediate value", namely, the excitement and the feeling of being connected/understood by others as members get acquainted to each other through participatory learning activities. Second, there is the "potential value", which relates to getting a mental pool of new tools, tips, and ideas but also personal connections that individuals get through their community participation. Third, CoPs produce "applied value" that concerns the changes in individual and collective practices or decisions informed and influenced by knowledge and insights gained from the community. Fourth is the "realized value" emerging from performance improvements that result from having applied new practices suggested by the CoP. Finally, there is the "reframing value" that focuses on the broader transformative effect that CoPs can trigger through its influence on people and practices.

To better situate the VCF in the context of water management, we have grouped those values into three broader buckets (Table 1). Since the 'immediate' and 'potential' values deal with how people exchange and work together, we decided to group those into "relational outcomes". The 'applied' and 'realized' values were brought together as "technical outcomes" as they capture the effect of a CoP on how people change how they take decisions and actions in water management. The third group, "transformative outcomes", pertains to the CoP contribution towards reframing how people think and approach water management. Recognizing that the effect of learning can go beyond the social unit where they were generated (Reed et al., 2010), we characterized "transformative outcomes" as either 'internal' or 'external' depending on whether they affect community members only or trigger broader societal changes such as a shift in collective preference or change in policy and organizational structures.

4.4.1.   Relational value: improving how people exchange and work together
The consulted CoP leaders have all reported that their community has contributed to improving how people exchange and work together—relational value production. Many of the consulted communities see networking and the ability to connect people who don't normally get the chance to work together as a valuable outcome in itself. This is especially true for a field like water management, where the problem is not necessarily about the lack of tools and hard technical knowledge but about being able to work with people across scales and sectors (Tremblay-Lévesque et al., 2022; Yasuda et al., 2024). Reflecting on the importance of their community and what it brings to its members, a CoP moderator argues that "just connecting people to know each other. It's 80% of the outcome" (participant 21, personal communication 24/04/2024).

That said, online communities have generally reported difficulties generating a true sense of mutual reliance and trust among their members, perhaps especially so for those created amidst the Covid-19 pandemic. This matters as the production of relational value sets the quality of the learning environment and gives the foundation for being able to generate technical and transformative value (Wenger-Trayner et al., 2020). One of the consulted CoP coordinators shared the importance of in-person meetings as part of the process of growing and nurturing the community and how this has created limitations for their community:

> *"Our regional CoP has been around for about nine years, addressing specific topics. Thus, the exchanges have evolved to deepen topics such as water reuse practices and water monitoring systems […] we have pretty much only online meetings, which allows for every three-month exchanges. Although, in the two face-to face meetings, we were able to develop join products and the time for the discussions allowed further connections among participants, despite that only half of the leadership was able to come"* (participant 10, personal communication 17/04/2024).

Building relationships among CoP members takes time and requires repeated interactions over an extended period (Ikioda, 2014). For many CoP managers, the pandemic highlighted the importance of informal face-to-face interactions, such as coffee break conversations and post-workshop dinners, in fostering genuine relational value within their communities.

4.4.2. Technical value: improving how people take decisions and action to manage the resources

Almost all consulted CoP leaders had stories about how their community has contributed to changing water-related practices and decisions. The WASHLAC Group[20] provides a good illustration of a CoP's direct contribution to the uptake of new practices based on the knowledge produced via a CoP:

> *"When COVID started, we [core group CoP members, in partnership with the academia] developed a regional study, to collate the COVID response measures by 26 countries in the region[21]. The measures were categorized using an analytical framework, depending on whether they were intended to support service users, households and institutions, or service providers, and it was disseminated and discussed in the WASHLAC network[22]. The research has been fundamental in several countries to develop a response framework for WASH in the face of COVID.*
> (participant 20, personal communication 24/04/2024).

This is also the case of the HEPEX community[23] which has played a significant role in promoting the uptake and use of probabilistic and ensemble techniques in various hydrological applications, including the European Flood Awareness System, now an operational service, and the Hydrologic Ensemble Forecast Service in the United States,

which has been used since the 2010s for forecasts ranging from sub-daily flood events to seasonal streamflow outlooks (Ramos et al., 2018).

New projects and collaborations are additional illustrations of technical outcomes produced by CoPs operating in the field of water and environmental management. A member of the AGUASAN community expressed that the CoP has been an excellent platform for individuals to explore new collaborative opportunities together:

> *"people were discussing when they were exchanging knowledge. They were suddenly like ohh, this is a new box that we are opening up. You know this new kind of adaptation measure, and since there's the funder in there is an implementer in. There's an academic in they were like ohh, why didn't we just quickly sit together and work this out"* (personal communication, participant 24, 25/04/2024)

A concrete example is the student exchange programme established between universities in Tajikistan and Kazakhstan after representatives met in a workshop organized by the Central Asian CoP on the WEFE Nexus (participant 13, personal communication, 19/04/2024). Members of the CoP also organized a joint international conference on the theme of "Water for Peace" to celebrate World Water Day 2024 together, out of which a collection of several scientific articles and technical references were published (CAREC, 2024).

Adopting new practices and projects has also led to performance improvements such as reducing duplication, cutting costs, saving time, and other forms of "realized" value. For instance, after discovering that they were working on similar issues and engaging an overlapping number of international experts, two demonstration site coordinators from the WEFE4MED community decided to co-host a webinar series. This collaboration allowed them to share responsibilities and save considerable time. Similarly, other project leaders who are members of this CoP opted to hold their project closure conferences as a joint event, enabling them to reach a larger audience within the same budget. The World Bank Water Communities have also accelerated technical support services, allowing countries to receive advice and information within days, rather than the weeks or months normally taken through regular bureaucratic technical assistance processes (personal communication, participant 29, 24/05/2024).

4.4.3. Transformational value: changing how people think and approach water management

Aligned with King et al. (2023), we propose that communities can change the way individuals and groups think and approach water management, which by extension may ignite paradigm shifts. As hitherto mentioned, transformational change can manifest itself in a person or group but also in the form of a system-wide shift, such as seen with new policies or power structures. At the individual level, we can reasonably argue that communities built

around specific paradigms such as integrated drought management (UNCCD and IDMP communities), the WEFE Nexus (WEFE4MED and Central Asian CoPs), or nature-based solutions (NbS in Water Management CoP) have helped clarify and popularize their respective concepts within and outside their CoPs, thus contributing to a gradual paradigm shift within their respective domains (personal communication, participant 34, 04/06/2024). They have also appeared to be mechanisms for self-realization and empowerment, as with the Global WEF Nexus Community, which has helped early career researchers gain agency and recognition as technical experts and leaders in their field.

As communities are embedded within broader systems and structures, transforming people's mindsets, however, is almost always only partially traceable to the social learning that a community helps generate. In this light, one of the CoP coordinators shared that they would be worried about claiming much when changing how people think about water management (personal communication, participant 4, 09/04/2024). This is not to say that CoPs don't produce transformational change at the individual level. Still, cognitive shifts take time and normally happen through engagement in multiple social learning spaces. Based on the interviews, most CoP leaders are, however, too limited in their current monitoring and evaluation (M&E) capacities to disentangle when and how influential their community has been in contributing to changing its members' mindsets.

CoP leaders and experts consulted were likewise very careful in claiming attribution in policy change. Stories about their work, however, reveal key contributions and input into policy change processes. This holds especially for communities where members are embedded within governmental structures such as the UNCCD CLP mostly composed of national focal points and where the common practice is centered around enhancing drought policy processes and institutional structures. Using the community as a peer-to-peer coaching mechanism, the UNCCD CLPs are actively supporting the preparation and enhancement of national drought plans across the world, including the preparation of regional drought management strategies (UNCCD, 2024). Other communities, such as the Open Government CoP and the WASH LAC Group, which have engaged several governmental representatives, have also directly contributed to policy outputs like ministerial declarations and new standard operating procedures for governmental agencies (personal communication, participant 20, 24/04/2024).

Interviews revealed that one of the key areas where CoP have demonstrated transformational value is in reshaping organizational learning culture and power dynamics within institutions. The IDMP and World Bank Water Communities are prime examples of how these communities are transforming the interactions between sponsoring organizations—the WMO and GWP for the former, the World Bank for the latter—and their country counterparts, who are now seen as co-learners rather than mere recipients of knowledge. In the case of the IDMP online community, the operational framework of the program is being shifted, fostering a new type of relationship between international organizations, their counterpart

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ministries, and the national experts and scientists collaborating with them. The CoP platform has also altered the power dynamics, enabling member states to bypass the secretariat for technical assistance and instead engage with one another as equal learning partners. As one CoP facilitator mentioned, the ultimate goal for the IDMP community is to reach a point where "we [the secretariat] won't need the help desk anymore, and people will just interact within the community" (Personal communication, participant 34, 04/06/2024). This shift is also evident in the World Bank Communities, where CoPs are transforming previously "vertical" relationships into "horizontal" ones, positioning the Bank as a facilitator rather than a provider of knowledge (Personal communication, participant 29, 24/05/2024). This highlights the transformative potential of CoPs in reshaping how major international water management organizations approach capacity development and technical backstopping.

5. Conclusions

This research developed an empirically grounded analytical framework that helps examine how CoPs may operate and produce tangible outcomes through social learning in water resources management. A practical application of this framework is its utility in identifying key functional competencies for community management. Using the schematic elements of this framework as a reference, we created a checklist comprising of eight areas that leaders of water-related CoPs should prioritize (Table 2). While this checklist does not guarantee a community leader's success, it can help them address key design questions and anticipate common challenges in establishing and maintaining their communities (Carvajal et al., 2008). Although the framework and checklist are rooted in the experiences and stories of water-related CoPs, they can be adapted and applied to communities in fields beyond water management.

Using this checklist alongside the information gathered during our consultations, it appears that CoP leaders tend to perform most poorly in the functional competencies related to M&E of outcomes. Among the 33 experts interviewed, only 16 could attribute impacts to their CoPs beyond generating relational value, and just 5 reported achieving transformational outcomes. This gap can be partly attributed to the challenges of assessing technical or transformational impacts, which typically require collecting qualitative data—a process that demands time, resources, and pre-established M&E frameworks. Interestingly, the five communities that successfully tracked transformative outcomes were also the only ones with well-developed methodologies for collecting and analyzing qualitative data from their participants.

Table 2. Checklist of Key Functional Competencies for Water-Related CoPs Coordinators

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Context

- ✓ Monitoring the bio-physical environment while aiming to identify potentially relevant hydrological events, pressures, and challenges that can be used to draw attention and generate community momentum.
- ✓ Scoping the socio-political environment to seek alignment between the CoP and politico-institutional processes, strategically positioning the relevance of the community towards realizing broader societal interests and ambitions.

Processes

- ✓ Identifying the types of questions that keep community members up at night and ensuring that the learning pursued by the CoP is oriented towards matching those needs.
- ✓ Analyzing the community's learning needs and pursuing learning orientation while considering available resources to inform which aspects of experiential learning should be prioritized.
- ✓ Seeking to identify a balanced membership model and community size that is consequent with the social learning ambitions and change that CoPs members are aiming to realize.

Outcomes

- ✓ Assessing the extent to which CoP activities and engagements allow people to meaningfully get to know each other and exchange their knowledge and experiences.
- ✓ Evaluating the level to which CoP members are changing their practices and analyzing the impact of those new ways of doing.
- ✓ Monitoring how the CoPs trigger and contribute to transformational change that manifests itself within and outside the community structures.

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To address this, a practical recommendation for water-related CoP facilitators is to use the value-creation story matrix template developed by Wenger et al. (2011). This ready-made framework helps gather and process individual accounts to form a comprehensive picture of the value generated by a community. Communities like the UNCCD CLPs and the Central Asian CoP on the WEFE Nexus have successfully implemented this template as the foundation for their M&E frameworks, documenting compelling transformative impacts. Additionally, CoP facilitators can employ online surveys with multiple-choice and scale ranking questions to evaluate learning outcomes from events, as done by IDMP CoP and UNCCD CLPs. Such M&E tools are often used in CoPs in healthcare (Jiménez-Zarco et al., 2015; McLoughlin et al., 2018) and education (Tseng et al., 2014). Furthermore, CoPs with online platforms should monitor metrics like downloads, views, and exchanges, a practice widely adopted in the development sector over the past two decades (Thoto et al., 2017; Ijjasz-Vasquez et al., 2024).

Finally, we would like to highlight two key issues that we were unable to address within the scope of this paper, but we believe present promising directions for future research. One limitation of our framework is that it did not explore how power dynamics and the politics of learning play out within water-related CoPs (Biesta, 2018; Rerup & Zbaracki, 2021). Several CoP leaders we consulted mentioned facing considerable challenges in trying to align perspectives and build consensus in defining the learning agenda of their CoP. Future research could delve deeper into these negotiation processes, exploring who decides what should be learned, how it should be done, and how these issues are discussed, negotiated, and agreed upon (Keen et al., 2012). Noting that most of the CoP leaders we interviewed facilitated online communities, it would be interesting to explore how the politics of learning manifest differently in virtual versus face-to-face CoPs.

Another connected issue that warrants attention is, how to deal with the multiplicity and increased instrumentalization of CoPs in the water space. Although CoPs are traditionally conceived as self-organizing (Catana et al., 2021), our research revealed that many water management CoPs are established by sponsoring organizations, most of which are based in the Global North. As the number of CoPs in the water space grows, the risk of duplication and competition between communities also rises. However, few studies examine how water-related communities impact one another in competitive settings, including how creating new communities or networks can sometimes undermine previously well-functioning ones (Ikioda, 2014). As only two of the communities that we interviewed were self-grown, one future area of work could be to study from their perspective what happens when new sponsored communities are established. This also calls for a deeper analysis of CoPs' ecosystems within specific water domains, including the impact of collaboration, coordination, and competition on learning across the landscape of water-related practices. Lastly, this also highlights the need for greater focus on the decolonization of knowledge and to analyze the critical role that sponsors play in either fostering equitable knowledge systems or perpetuating unequal patterns of knowledge creation and utilization (Boyes et al., 2023).

Acknowledgements

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Annex 1. Examples of CoPs Related to Water Resources Management.

Clusters	Name	Description	Scope
Water Sanitation and Hygiene (WASH)	AGUASAN CoP	**Domain:** Promote wider and deeper understanding of key issues in water and sanitation in international cooperation. **Practice:** Regular face-to-face workshops, quarterly one-day knowledge exchange events, position papers. **Community:** Swiss-based water and development practitioners, or those professionals working in a Swiss-based organization	• Switzerland • 51 members
	SUSANA Working Groups	**Domain:** Promote a shared vision on sustainable sanitation towards achieving the Sustainable Development Goals. **Practice:** Yearly in-person meeting, trainings, webinars, conferences. podcasts, e-compendiums. **Community:** Sanitation sector professionals, policy makers, researchers.	• Global (with regional chapters in India, West Asia and North Africa, Africa, Latin America) • 15,000+ members
	WASH LAC Group	**Domain:** Strengthen sectoral coordination and response capacity of the WASH sector at national and regional level in emergencies, resilience building risk reduction, and disaster preparedness. **Practice:** In person and online training, technical assistance, bulletins **Community:** National government, UN, INGO, National NGOs, water supply operators, academics, donors.	• Latin America and the Caribbean • 1,400+ members
Water-Energy-Food (WEF) Nexus	Central Asian CoP on the WEFE Nexus	**Domain:** Ensure water-energy-food-ecosystem security in Central Asia. **Practice:** Mentoring program, expert and project database, creation of surveys, collection of knowledge products, online courses. **Community**: representatives of educational and research institutions, government agencies, international	• Central Asia • 34 members

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		organizations, youth and other stakeholders.	
	WEFE4MED Nexus CoP	**Domain:** Foster the adoption of a Water-Energy-Food-Ecosystems (WEFE) Nexus approach in the Mediterranean. **Practice:** Identification and dissemination of demonstration sites, conferences, policy briefs, matchmaking, webinars, competitions, courses. **Community:** Practitioners, scientists, policymakers, civil society, media, entrepreneurs, innovators, and investors.	• Mediterranean • 112 Members
	Global WEF Nexus Community	**Domain:** Build capacity and generate transdisciplinary thinking on water, energy, food, environment, health, and climate change. **Practice:** Summer schools, webinars, training workshops, symposia, podcasts, blogs. **Community:** Researchers (early-, mid- and senior-career), postgraduates, policymakers, practitioners.	• Global • 1065 Members
Water-Related Disaster Management	EOTEC Communities	**Domain:** Increase the use of Earth information in decision-making on climate change and disaster management. **Practice:** Webinars, tools and guidance, collection of real cases and application of earth observation, conferences and events, training workshops. **Community:** Capacity development managers, trainers, educators or professionals and subject matter experts interested in EO-related capacity building.	• Global (with regional CoPs for Africa, Americas, Asia) • 236 Members
	IDMP CoP	**Domain:** Foster the adoption of Integrated Drought Management based on the three pillars approach. **Practice:** Virtual exchanges, in person annual meetings/conferences, technical discussions, online courses.	• Global • 103 members

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		Community: Drought technical experts, academia, and other practitioners from different sectors and levels.	
	UNCCD Community of Learning and Practice (CLP)	**Domain:** Support drought preparedness systems and national drought plans and working together at the regional level to reduce drought vulnerability and risk. **Practice:** webinars, conferences, workshops, serious games, courses, photo and case study competitions, case clinics. **Community:** UNCCD National Focal Points, national governmental officials and experts and other professionals interested in drought, UN experts	• Global (with 5 regional CoPs in Asia, Africa, Latin America, Central and Eastern Europe and North Med.) • 240 Members
Water and Environment	Nature Based Solutions (NbS) in Water Management CoP	**Domain:** Build recognition on the use of nature-based solutions in water management, particularly for disaster management and wastewater treatment. **Practice:** Blogs, discussions, interviews, webinar series, funding opportunities. **Community:** practitioners, governmental authorities, young professionals working in NbS for flood and drought management and wastewater.	• Global (with a regional focus on Central and Eastern Europe) • 149 members
	ElAguaNosUne CoP	**Domain:** Promote sustainable and responsible water consumption though monitoring, corporate water stewardship, and ecosystem conservation. **Practice:** Technical guidelines, conceptual and regulatory analyses, recommendations, online events, youtube channel, and courses. **Community:** Professionals and practitioners from the public and private sector, civil society, academic or research institutions, consultants, water funds, among others.	• Latin America • 290 Members

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	IAHR Communities	**Domain:** Foster research and technical applications in hydro-environmental sciences. **Practice:** Symposiums, conferences, workshops, draft technical reports, joint publications. **Community:** Water and environmental researchers, specialists, and practitioners.	• Global • 5000+ members

Annex 2. List of Interviewed CoP Experts.

No	Stakeholder Type	Community Affiliation(s)	Community Role(s)	Interview Date
1	Intergovernmental Organization	NbS in Water Management, UNCCD CLP	Community leader/moderator	22.03.2024
2	University/Research Institute	WEFE4MED	Core group member	27.03.2024
3	University/Research Institute	SDG IWRM	Expert	08.04.2024
4	University/Research Institute	NbS in Water Management	Community leader/moderator	09.04.2024
5	Intergovernmental Organization	SDG IWRM	Community leader/moderator	12.04.2024
6	Intergovernmental Organization	SDG IWRM, Transboundary	Co-Moderator	12.04.2024
7	Intergovernmental Organization	WEFE4MED, UNCCD	Knowledge manager	12.04.2024
8	University/Research Institute	EOTEC DevNet	Community leader/moderator	16.04.2024
9	Private Sector	EOTEC DevNet	Community leader/moderator	16.04.2024
10	Governmental Organization	El Agua Nos Une	Sponsor	17.04.2024
11	Governmental Organization	El Agua Nos Une	Community leader/moderator	17.04.2024
12	Governmental Organization	El Agua Nos Une	Community leader/moderator	17.04.2024
13	International Organization	Central Asian CoP on the WEFE Nexus	Community leader/moderator	19.04.2024
14	International Organization	Central Asian CoP on the WEFE Nexus	Community leader/moderator	19.04.2024

15	International Organization	Central Asian CoP on the WEFE Nexus	KM Manager	19.04.2024
16	International Organization	IAHR Communities	Sponsor	19.04.2024
17	Intergovernmental Organization	SDG IWRM Community	Core group member	19.04.2024
18	Private Sector	BONEX, WEFE4MED	Community leader/moderator	23.04.2024
19	Private Sector	BONEX, WEFE4MED	Advisor	23.04.2024
20	International Organization	Open Government CoP, WASH LAC Group	Community leader/moderator	24.04.2024
21	Intergovernmental Organization	Transboundary Knowledge Hub	Community leader/moderator	25.04.2024
22	University/Research Institute	SUSANA, IWA Community, Aquasan	Community leader/moderator	25.04.2024
23	University/Research Institute	SUSANA, Aquasan	Community leader/moderator	25.04.2024
24	Intergovernmental Organization	WASH LAC	Community leader/moderator	29.04.2024
25	Governmental Organization	SUSANA	Sponsor/Advisor	03.05.2024
26	Private Sector	Central Asian CoP on the WEFE Nexus	Sponsor	06.05.2024
27	Private Sector	Central Asian CoP on the WEFE Nexus	Sponsor	06.05.2024
28	Intergovernmental Organization	World Bank Water Communities	Community leader/moderator	24.05.2024
29	Intergovernmental Organization	World Bank Water Communities	Community leader/moderator	24.05.2024
30	Intergovernmental Organization	IDMP	Sponsor	27.05.2024
31	Intergovernmental Organization	IDMP	Community leader/moderator	27.05.2024
32	Intergovernmental Organization	IDMP	Community leader/moderator	04.06.2024
33	University/Research Institute	Global WEF Nexus CoP	Community leader/moderator	11.06.2024

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[1] https://www.floodmanagement.info/e2e-ews-ff-community-of-practice-area/
[2] https://connect.newibnet.org/
[3] https://www.opengovpartnership.org/community-of-practice-on-water-and-open-government/
[4] https://iwrmactionhub.org/connect/communities
[5] https://droughtclp.unccd.int/clp/home

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[6] https://iwa-network.org/iwa-specialist-groups/

[7] https://iwrmactionhub.org/pt-pt/group/naturebasedsolutions/about

[8] https://www.riverbp.net/eng/community_of_practice/profile/about/

[9] The NbS in Water Management CoP has a regional focus on Central and Eastern Europe, though it remains technically open for experts across the world to join.

[10] https://www.iahr.org/index/committe/14

[11] https://www.iahr.org/index/technical

[12] https://www.droughtmanagement.info/idmp-community-of-practice/

[13] https://wefe4med.eu/wefe/home

[14] https://bonex-prima.eu/wefe-nexus/#community-of-practice

[15] https://www.linkedin.com/groups/9530027/

[16] https://thewaternetwork.com/organization-c6k/aguasan-vAQIs962k2aXf2ysoZi4Dg/home

[17] https://iwrmactionhub.org/group/armeniadrought/about

[18] https://forum.susana.org/

[19] After realizing that this was slowing down the community's work, the CoP coordinators decided to stop having a formal admission process and adopt a click and join approach. They now moderate the website weekly, deleting fake accounts and irrelevant materials (personal communication, participant 15, 30/10/2024).

[20] https://www.washlac.com/eng

[21] https://siwi.org/latest/siwi-publication-receives-best-of-unicef-research-2022-award/

[22] https://siwi.org/wp-content/uploads/2020/04/Covid-19_WASH_EN_Basic-note.pdf

[23] https://hepex.org.au/

Confluence of knowledge: cyclical steps for transdisciplinary research in practice, Brazil

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Transdisciplinarity has been widely emphasized as an alternative approach for mitigating the social-environmental crises, and it is motivated by the limitations of compartmentalized disciplinary research. Transdisciplinarity is also a methodological process of learning and co-production, but its success requires attention to the complexity of human relationships, such as diverse values, interests, and tensions. This article aims to share insights from a transdisciplinary process co-developed with a fishing community and an academic research team in Brazil. It discusses steps for taking transdisciplinary research into practice, while also offering critical perspectives. By reflecting on these steps, I hope to assist research involving various stakeholders in better understanding the responsibilities and practical demands involved in converging different knowledge(s). By offering new avenues for addressing the problems of our interconnected world, the article asks for creativity and engagement to understand and develop practices of confluence of knowledge. This article does not aim to bring a recipe or a rigid structure to transdisciplinarity, but it is an invitation to think about how (or if) we are doing transdisciplinary science in a transformative way. Are we just reproducing the dominant pattern of science or creating novel pathways?

Keywords: transdisciplinarity; participatory action research; emotions: transformative, methodologies; Brazil

Introduction

Transdisciplinarity has been widely emphasized as an alternative approach to mitigate the social-environmental crises we are facing, and it is motivated by the challenges we find when we just solely consider disciplinary ways of thinking (Ludwig and Boogard, 2021). I understand transdisciplinarity as a research approach that aims to bring together different

types of academic, indigenous, traditional and empirical knowledge, ways of thinking, interests, and socio-cultural systems (Scholz and Steiner, 2015; Popa et al., 2015; Bammer et al., 2020). Transdisciplinarity is also a methodological process that can lead the process of learning and co-production. But to achieve this we must pay attention to the complexity of human relationships, such as diverse values, interests, and tensions (Ludwig and El-Hani, 2020; De La Rosa et al., 2024). This article builds upon a long-standing collaboration between the academic group and a fishing village in Brazil. This relationship, which began 9 years ago, has been shaped by shared efforts to address environmental and social challenges. Community members have actively participated in shaping research questions and co-creating knowledge, reflecting their interest in preserving traditional practices while navigating shifts toward a tourism-based economy. Their involvement in this process stems from a desire to ensure the sustainable development of their community while preserving their cultural heritage. This partnership has fostered mutual learning and trust, which have been essential for the success of the transdisciplinary process described in this article.

Transdisciplinarity can and should be about the confluence of knowledge. Confluence, a term introduced by Nego Bispo (2023), is the coexistence of elements that are different from each other but still come together in practices and worldviews. This is a crucial aspect of the *quilombola* way of perceiving the world. Quilombos are communities originally established by people of African descent who escaped slavery. In some cases, they also included Indigenous peoples and other marginalized groups, creating spaces of mutual support and cultural exchange. These communities have long been symbols of resistance, preserving Afro-Brazilian cultural traditions, oral histories, and a deep connection to the land through practices like small-scale agriculture. Today, quilombos continue to play a vital role in Brazilian society, advocating for land rights and contributing to the nation's cultural and political identity. Nego Bispo is a *quilombola* who describes himself as a translator, who moves between the preserved oral knowledge and the knowledge of outsiders. As stated by him:

> *A part of my being that is water, cooling the other part which is fire, through another part which is air, evaporated. And flowing through the cosmological space, in this part which is the earth, it solidified. And merging with other lives, in other bodies, existing and resisting, here I am.*

This free translation of his poem, originally in Portuguese, and recited in an interview for *Itaú cultural* (2021) exemplifies how important it is to exchange knowledge and thoughts among beings for this marginalized group, who are also powerful fighters. We all are part of the same earth, we are part of the whole. The confluence between these different people from Africa and the different original Brazilian people, enabled them to keep their understanding of the world as a way to resist and to preserve their knowledge from the colonial epistemicide. Throughout this paper, I explore the concept of confluence and develop an analogy with

transdisciplinarity, endeavoring to integrate this perspective into academic discourse as a means of understanding the world.

Here we are talking about the confluence between different realms of science, various social actors, and forms of knowledge that come together and interact to become something greater. Like a river, where its tributaries merge, becoming one and flowing into the sea. However, we need to be aware that confluence does not mean that everything will be integrated. Still using the idea of a river, we can see the water flowing also through different pathways, with a small water's body, like small streams. The confluence of knowledge, along with its divergences, shows us the partial overlap between different systems of understanding (Ludwig and El-Hani, 2020). Bringing to the light that not everything is dancing in a perfect choreography, but that we do have many disagreements and divergences that deserve our attention.

To follow this path, it is important to understand steps to make these different knowledges partially converge in a living river. By steps, I mean the types of actions to navigate among the huge pool of knowledge of different actors. Actions such as building interpersonal relations and organizing everyday necessities of fieldwork that are of crucial importance for making transdisciplinary research succeed in practice but too often neglected in theory-driven debates about transdisciplinarity. This article therefore adopts a practice-oriented perspective when asking how to build a critical but still safe space for people who come from different parts of society to share their learnings which could come from their ancestors, their life experiences and/or from books as well. How to avoid reproducing the inequalities prevalent in society, understanding that there are different ways to understand and explain the world, and that western science is not the only source of valid knowledge (Chilisa, 2019; Krenak, 2020). While this paper acknowledges the vital role of communities in shaping and sustaining transdisciplinary efforts, its focus is on the researchers' responsibilities. Researchers must ensure their practices foster ethical, equitable, and effective collaborations, addressing power imbalances and creating spaces that allow diverse voices and knowledge systems to thrive.

To address this complex situation, community-based participatory action research (PAR) is a good possibility. PAR often appears as an alternative or extension of dominant scientific methods, serving as a means to transdisciplinarity theory with local action. This approach comes from the confluence of Paulo Freire's pedagogy, Orlando Fals-Borda, and feminist critiques (Smith, L. et al, 2010). It brings the idea that scholars should partner with the community members, instead of leading studies in the communities. To think and apply this type of research, academics need to open their minds to alternative ways to think about research questions, also thinking out of the box about what means to collect data, and how to do *science*. In the century we are in, it is unacceptable to still not include the diversity of people, especially racialized individuals, and minorities as a whole (Gonzalez, 2020).

In this article, the goal is to share part of the process co-developed over the last few years in an academic group and the fishing community of Siribinha in Brazil. The aim is to discuss the importance of each of the steps, while also offering critical perspectives. As Nego Bispo (2023) highlights, confluence of knowledge does not proceed in linear but rather cyclical steps that return to the beginning through a cycle of *início-meio-início* (start-middle-start) and therefore remain in constant interaction and tension. By sharing my own experiences in making these cyclical steps, I hope to assist anyone who desires to undertake research involving various actors in better understanding the responsibility involved in converging different knowledge(s) and developing their pathway to do so effectively.

Material and methods

I first arrived in Siribinha, a fishing village with approximately 500 inhabitants, located near the mouth of the Itapicuru River (Bahia, 2003), in 2017. It is part of the municipality of Conde, located on the northern coast of the state of Bahia, Brazil, which had an estimated population of 23,651 people in 2022 (Instituto Brasileiro de Geografia e Estatística, 2024). I chose this fishing community for investigation due to its deep ties with the Federal University of Bahia, established through an educational and conservation project developed in the community since 2016 by a team interested in conducting an inter and transdisciplinary research. At that time, my background was in biology, and I was beginning to develop a deeper understanding of ecology. I was interested in better understanding how to develop a conservation approach with the community, although with a limited theoretical foundation.

I chose to practice participant observation, conduct semi-structured interviews, and carry out Quick Participatory Diagnosis (QPD) in the community. Chambers (1995: 1253) defines QPD as 'a growing family of approaches and methods aimed at enabling the local population to share, enhance, and analyze their knowledge of reality, with the goal of planning actions and intervening in that reality.' This methodology was developed by the International Institute for Environment and Development (IIED) as an approach that involves various actors to ensure their full engagement in the evaluation process, interpretation, and validation of the results, as well as in generating ideas for action. The process is crucial for transparency and ownership, ensuring the accuracy and credibility of the results, and garnering support for acting (Booker and Franks, 2019). Nevertheless, I was facing a lot of challenges to engage more community members in this project. And I was trying to understand these challenges in a pragmatic and straightforward way, as it is taught to natural scientists. But are the problems from the real world something so straightforward to solve?

With these lived experiences, including the challenges, failures, and successes, I began to question whether these methodologies, and if the way I was practicing them, were sufficient to achieve my goals. The main aim was truly to include other systems of knowledge in the

decision-making process. I also began cultivating a strong relationship with some of the community members, and it grew over time. I started contemplating the significance of these relationships in involving them in the process, understanding their perspectives, and translating academic language for other actors. Moreover, I started on developing my background in social science and embracing a decolonial perspective on ecology. I began to confront the simplicity, and simultaneously the complexity, of attempting to weave together different narratives and forms of knowledge. It is a deeply enriching experience to serve as a mediator in the process of confluence.

Over the next few years, the research team developed strategies to better interact with the members of the Siribinha community, as well as with other stakeholders such as the research team itself, local policymakers, and community representatives from other surrounding locations (Figure 1).

Figure 1. Timeline of the work developed by the author with the artisanal fishing community of Siribinha, Conde, Brazil.
Source: Author.

The six steps I will present in the sections below are the culmination of this multi-year engagement in a transdisciplinary project in Siribinha, which has encompassed numerous successes and failures. This represents a summarized version of the many lessons learned throughout this process, intended to provide outsiders with insight into engaging in this type of research. Returning to the cyclical concept of Nego Bispo, the aim is not to pave a linear path or reach a definitive conclusion, but rather to continually refine and adapt previously proposed ideas. Here, I emphasize the significant importance of the following aspects: (1) The team: It is crucial to consider the interpersonal relationships among the research team to

improve practices and results. (2) Fieldwork: Careful preparation and reflexive organization in the field. (3) Developed and used methodologies: Reflection on how to enhance methodologies and foster creativity throughout the process. (4) Facilitating community meetings: Creating a safe space for dialogue and exchange among individuals facing similar challenges. (5) Facilitating meetings between multi-stakeholders: Acknowledging the importance of involving various actors and creating space for dialogue. (6) Education through courses: Sharing insights with the new generation of researchers and incorporating fresh perspectives into the ongoing process of improvement.

Lessons from the research

1. The team

If a research team aims to have a transdisciplinary vision of doing science, it implies understanding the importance of maintaining good and equitable working relationships that go beyond isolated moments of meetings and experiences in laboratories or offices. It is necessary for the team to be composed with consideration of different objectives, converging interests and expertise to develop appropriate theoretical foundations, approaches, and interactions with other actors and social sectors. To achieve this, it is essential that the team is committed to this goal and develops fundamental skills for open, sincere, and empathetic dialogues with their colleagues and partners. This enables alignment for collaborations in the development of methodologies and interventions, in order to avoid group fatigue from interactions. This way, different skills and knowledge can join forces to produce high-quality work.

Transdisciplinary activities often involve fieldwork and daily interactions between diverse actors that can last from a few days to extensive multi-year collaborations. The activities faced often involve interactions with everyday domestic activities, household work, for example. Typically, this aspect is not considered in academic debates about transdisciplinarity, yet it significantly influences practices. This aspect, deeply studied since 1987 by Arlene Daniels and described as 'invisible work' (Poster et al., 2016), though not directly related to transdisciplinarity, is clearly present in the internal dynamics of a team. It prompts us to question what qualifies as work and why certain types of work go unnoticed, particularly in fieldwork where researchers are expected to solely focus on research, leaving unattended the responsibilities and daily tasks that support it. Often, these contributions remain unrecognized, rendering both the work and workers invisible. Challenging traditional definitions of visible labor highlights the gendered nature of invisible work. An environment of respect, care, and understanding must be developed among team members. One cannot import misleading ideas of neutrality and impartiality from science into the field, as if relationships did not also converge and influence each other (De La Rosa et al., 2024). This

lived experience is often not well-represented in scientific work when we refer to transdisciplinary approaches.

Figure 2. Picture of the research team in front of the house we stayed for a few months in early 2022.
Photograph: Islane Lessa. Reproduced with permission of the author and participants.

In my experiences over the past years of research activity with a transdisciplinary team working in this fishing community, I have observed a relatively higher number of women researchers (still mostly cis and white) than men. Indeed, the relevance of both gender and race for invisible day-to-day work has been widely reflected in feminist and intersectional debates including Gonzalez (2020) and Crain et al. (2016). This predominance has consequently had an impact on the challenges and successes we have shared. Sharing a house with 9 women made me develop a better understanding of this (Figure 2). By this time, if we did not organize, for example, a schedule with the daily tasks (i.e., sweeping the house or disposing of waste), things could be a bit chaotic. And I need to say that it was not noticed by me at first, but by a colleague who was doing her first fieldwork in this community. Nobody taught us about this, nobody talked about this on our research team before, or in the classes I had during my bachelor's, master's, or PhD. But how do we manage a house with so many researchers, full of work to do, but also full of this invisible work to manage? How important is it to have a sense of community and cooperation to overcome these difficulties and develop

healthy relationships that allow us to continue collaborating in our research? In my point of view, it is a negligence to think that it is possible to completely separate the personal and the professional relationships. Especially in this case, when you are sharing your routine with a group, and you also realize that you depend on others to better develop your research and apply your methodologies.

Taking into account human aspects, such as intrinsic abilities and vulnerabilities, and revisiting these processes in an iterative 'start-middle-start' cycle (Bispo dos Santos, 2023), embracing the vulnerabilities and mutabilities of human beings, is essential for the improvement of careful transdisciplinary approaches that truly aim to challenge the research status quo.

2. Fieldwork

In many communities of the Global South, including Siribinha, challenges of doing transdisciplinary research are influenced by colonialism and perpetuate extractive practices and epistemic injustices (Chilisa 2019; Cooke and Kothari., 2006). Another well-known challenge is so-called helicopter research (Haelewaters and Hofmann, 2021) where little time is dedicated to the local community where one works. This practice reproduces top-down approaches, by simply grabbing data without understanding the community needing and desires. However, it has been increasingly questioned by transdisciplinary researchers (Cooke and Kothari., 2006) and depending on the research question and the reality of the involved group, more time is being spent on these field trips.

Many topics must be considered when organizing a fieldwork approach that lives up to transdisciplinary promises of more equitable co-production. From my perspective, the first point to consider is the researcher's relationship with the place and the people who live there. Is their reality similar to that of the place? Do they speak the local language? Have they been to that place or somewhere with similar nature and dynamics? These are the first questions that should be asked, and if the answer to any of them is negative, then one needs to think about how to minimize or alleviate the effects of these factors. How can you ensure individual safety in the field without knowing the local reality? The necessary transportation, the availability of medical assistance, and common accidents that may occur in that place are sometimes underestimated, while they should be considered as a fundamental part of the development of transdisciplinary research.

Organizing accommodation, considering the team's available time (as team members have personal lives and limited resources), the most viable and safe transportation for everyone, as well as the availability of that transportation (How will someone access medical care if they have health issues?) How will the team be provided with food? Where will the groceries be purchased, who will cook, how often, and how much will this impact the research being conducted? All of these are fundamental points that are closely related to the funding of these

research projects and trips. I do not want to say that just those who have been working previously in similar conditions are capable of developing good fieldwork. What I am saying is that it is important to take into account different layers and realities that we constantly face in the field. What can be part of your baggage if you also had developed in your life the interest for this type of research, topics and experience different engagements with vulnerable communities.

Transdisciplinary literature often fails to emphasize the importance of integrating practical perspectives into the discourse. It is crucial for researchers to delve into everyday concerns, as these underpin successful and empathetic transdisciplinary practices. Neglecting these real-world issues undermines our efforts in transdisciplinary research, hindering our potential impact.

3. Developed and used methodologies

To foster confluence of knowledge, allowing for a fairer translation of understandings and ways of seeing the world, we have various methodologies at our disposal. Beyond the well-known semi-structured interviews, it is important to keep in mind that when we want to understand someone else's perspective, we also need to make ourselves vulnerable. We need to create a space for mutual, sincere and open listening so that this dialogue can develop genuinely and enrichingly. Furthermore, as academics, we should consider that our creativity can be used as a means to make interactions more horizontal. I understand, therefore, that participatory methodologies, often artistic, allow for the interaction of different languages and forms of expression, as well as different ways of teaching and learning (Dupuis et al., 2022; Rowe, 2005). If we have a vast array of methodologies, interventions, and knowledge about our individual abilities, we start with our research question and develop ways to mediate and understand the convergence and divergence of these different worldviews.

After a few years working on this type of research, I understand that in the field, everything may be better when it is possible to start with good (1) participant observation (Musante and DeWalt, 2010). Having the opportunity to live with a community that is not from where you came from, understanding their daily life, comprehending the internal dynamics, and the power imbalance shown in their routine is an extremely rich opportunity to validate (or not) our previous perception as an outsider. That is how we can better understand if our theories and ideas are a good combination for the reality we are facing, and which kinds of adaptations will be needed. For better putting together this puzzle, the (2) field diary (Punch, 2012) is completely relevant. The diary can be made in your best way to reflect on all the information you are bombarded with in the field, which means that you can write but also draw or use pictures as a way to express your perceptions. After this, some (3) semi-structured interviews (Brinkmann, 2014) can be conducted aiming to confirm (or not) your perceptions, seeing if you will need to apply more methods and how, trying to turn this interview into a conversation between people who trust each other and want to develop something great

together. You need to speak their language and understand at least a part of their background to create this environment. Then could be the time to use your creativity to develop, adapt, and apply (4) arts-based workshops (Pearson et al., 2018) if you feel it would be helpful for them and for your research question. How to make research also a funny moment for them? How to make this meeting fruitful and a moment of confluence? Being completely open to hear and see their needs, and what types of interventions they would like to have, maybe your role as a researcher could also involve organizing and mediating some (5) other types of meetings, enabling some new encounters. With this in mind, it is possible to develop and adapt different methodologies for the specific groups in question.

Acknowledging these mentioned points above allows us to develop new forms of theoretically well-founded interventions, while also allowing improvisation to have a voice and space. The organization and necessary adaptations will be pre-planned, but it is known to those who have experienced these types of encounters in practice that adaptations and improvisations will always be necessary. And for this, it is very important to also consider the group with whom we are interacting. Are we dealing with a group of researchers? Where are they from? A group of a traditional community? What is the dynamic among them? Who are the people attending the meeting? Are we talking about a group of politicians? Who are they? What are the internal relationships within this group? Many questions must be asked before being qualified to interfere in the world of others. This is a role of great responsibility, and far from being trivial in the context of the disciplinary dynamics that Western academia is formulated upon. It is necessary to make a huge effort to prevent the group you are studying with from feeling overwhelmed during the process.

4. Facilitate community meetings

As an essential part of developing transdisciplinary research, we must consider the importance and relevance of creating constructive moments and spaces for the exchange of knowledge and different experiences among various stakeholders. The different methodologies mentioned earlier play a role in this dynamic, as does the motivation to organize these moments. If we, as researchers developing our projects, identify gaps and the need for exchange with other groups, it is also our responsibility to facilitate that.

Logistical organization is important, and the first step to consider is the budget available to make these moments happen. We are aware that, considering the research reality in Brazil (the country where many of these insights came from), this is a factor of huge relevance. Our science has been severely underfunded, and our research has been developed at the brink of unsustainability. Unfortunately, transdisciplinary research is not among the most funded areas, which significantly hinders the engagement of researchers in this field.

The organization of an event that brings together different representatives and stakeholders begins with the need for comprehensive knowledge of social groups and organizations. More

than just knowledge, it is necessary to establish a good relationship with them so that the invitation is considered and accepted in the first place. As a second step, it is necessary to coordinate the schedules of the participants and the availability of space. For example, in mid-2022 our research team had the opportunity to facilitate a meeting in the artisanal fishing village we are working with (Figure 3).

Figure 3. Picture of the fishers and researchers at the meeting in Poças in August 2022.
Photograph: Julia Turska. Reproduced with permission of the author and participants.

At this point, we recognized that they had many needs that we were not capable of solving, but far better to be exchanged among who were facing similar questions or having developed in a different way. Acknowledging this, we were motivated to organize and mediate a meeting with different artisanal fishing communities in the municipality of Conde. We invited representatives from the fishing communities from Ilha de Maré and Conceição de Salinas, both from the state of Bahia, but with their particularities in terms of organization and struggles. This created a space for dialogue, using some well-known methods to plan the next steps that the community could take to self-organize and solve some of their issues. Afterwards, our task as researchers in this area is to maintain engagement and devise methods to assist the community in applying the insights derived from such meetings.

5. Facilitate meetings between diverse actors
Following the same line of the need to allow and nurture spaces for the convergence of this knowledge, events can and should be organized to promote this exchange. These events can involve various members and groups from the academic community, as well as different community representatives. In this article, I present a successful example of an event that took

place in March 2023 at the Federal University of Bahia, co-organized and co-financed by the GEOS Project, The Netherlands (Figure. 4). The event, 'Communities of research, communities of practice: towards a transforming transdisciplinarity' brought together a Brazilian team that has been working on transdisciplinary research for nine years, researchers from different nationalities, backgrounds, and career stages, as well as members from traditional communities such as the Kayapó-Xikrin, residents of the fishing communities of Siribinha and Poças, and a member of the interstate movement of *quebradeiras de coco babaçu* (babassu breakers).

Figure 4. Pictures of the group who participated during the event 'Communities of research, communities of practice: towards a transforming transdisciplinarity' in March 2023.
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Initially, it was necessary to analyze the desired event format, consider the guest list, accommodation, catering, and transportation, and estimate the event's expenses. Afterward, invitations and a proposed agenda were developed. It was essential to plan the event's dynamics, organize space reservations, coffee breaks, as well as interactive activities such as city tours and event facilitation. We organized different parts of this event; some of them involved presentations for those who were not familiar with the city and the university setting. We believed it was only fair to introduce the place we were and the setting we, the researchers, came from, considering we always ask them to introduce their own place to us. This initiative was carefully planned to make the event as horizontal as possible.

Figure 5. Pictures of traditional communities in the event 'Communities of research, communities of practice: towards a transforming transdisciplinarity' in March 2023. 5A: Siribinha and Poças members, representatives of Kayapó-Xikrin and a member of the interstate movement of *quebradeiras de coco babaçu* during a round table. 5B: Pictures of Siribinha and Poças members presenting during the event. Copyright: Gabriela De La Rosa. Reproduced with permission of the author and participants.

The highlight of this event was, through this mediation and the years-long friendship and trust built with the participating communities, ensuring a safe space for them to have a voice and receive the necessary listening. We reserved some other moments for researchers working in the community to present their progress, results, and thoughtful insights through oral presentations and posters, with a language accessible for the whole public. It was a wonderful surprise that community members felt secure enough to interrupt and correct some of the oral presentations. For example, this happened when a colleague was discussing a paper combining academic and traditional knowledge from Siribinha and Poças, and community members asked to share their perceptions and point out any mistakes they noticed. They started conducting and leading this presentation in a very natural manner. We also tried to combine moments where the stage was given to them to organize their own way to present their reality, perspectives, and stories, in a way that the researchers and other interested public

were there to listen and ask questions. Previously, at this moment, we tried to align with them how we could support them, the format they wanted, and what they were expecting from us (Figure 5).

It was essential for the observations and knowledge of these communities to be valued by the attending academics, and this perception was constantly reaffirmed throughout the event. We had a significant relevance in this regard, and the expertise belonged to the members of the participating communities. Academics were actively corrected in their observations, personal exchanges took place, and emotions became part of the dynamic. This was something unusual in purely academic events. Throughout this and the previous sections, there is a consistent emphasis on the involvement of diverse systems of knowledge in transdisciplinary research, ranging from intellectual insights to emotional dimensions and various contextual factors. An interesting point to explore is the assertion that emotions are not just secondary elements but rather essential contributors to transdisciplinarity. This perspective seems to emerge implicitly as we explore into the intricate web of factors shaping transdisciplinary research and the attendant responsibilities of researchers. By acknowledging the role of emotions as central in the process, we challenge conventional assumptions that prioritize rationality over affectivity. This line of thought prompts us to reconsider the nature of knowledge creation, advocating for a more holistic approach that embraces both cognitive and emotional realms.

6. Education through courses

It is also important for the transdisciplinary process to share theoretical and practical knowledge with students in training. It was from this understanding that a course for the master's program in Ecology: Theory, Application, and Values and the program in Teaching, History, and Philosophy of Science, at the Federal University of Bahia, was organized by three PhD students with different academic backgrounds and experiences. The course, entitled 'Participatory methodologies: dialogue of knowledge and environmental conservation' had a workload of 34 hours and included artistic and participatory activities in addition to lectures. The course covered topics such as knowledge co-production, transformative participatory action research, communities of practice, theatre of the oppressed, and arts-based methodologies. These diverse themes stemmed from the different backgrounds of the proposing professors and were highly important and useful for the development of transdisciplinary work.

Courses like these should be incorporated into various graduate programs if we embrace the idea of transdisciplinarity as a guiding framework for our practices and activities. It is essential to overcome the barriers of disciplinarity and the homogeneity of backgrounds and *do science*. The development of this course aims to normalize access to different content from diverse areas and graduate as researchers with a holistic understanding of the socio-environmental challenges we face.

It is important not to romanticize the execution of courses like these but to discuss the challenges of coordinating such diverse schedules, the fast-paced nature of modern life, transportation costs, and space availability. Often, in published articles, we do not address these practical and very real aspects of implementing transdisciplinary theory into practice. Also, by sharing our diversity of knowledge and experiences throughout a course, it is possible to create a space that makes the students feel belonging to something. As feedback from this specific course, we heard many times, from different participants how they were missing this type of perspective. How they had no clue that more people are engaging in this type of doing science, sometimes with tears in their eyes. The group was really interested and engaged during the classes, bringing their own experiences, doubts, fears and desires. It was a place for a deep and nourishing exchange. And I acknowledge this to different things, but I am sure that one of them was the lack of these approaches in academic courses.

How can we expect people to know how to do it, how to navigate it, how to execute it? We need to combine theories with lived experiences, with practicality, and align the ideal with the achievable.

Conclusions

Transdisciplinarity promises a dynamic and indispensable approach that transcends the confines of traditional disciplines or our labs and offices. By offering new avenues for addressing the problems of our interconnected world, it asks for creativity and engagement to understand and develop forms to make the confluence of knowledge happen. However, transdisciplinary research also comes with complex practical demands from interpersonal relations to everyday necessities of fieldwork that often remain insufficiently reflected in the theory-driven literature on transdisciplinarity and can undermine its success and transformative potential.

This article does not aim to bring a recipe or a rigid structure about what and how to do transdisciplinarity, but it is an invitation to think about how (or if) we are doing transdisciplinary science in a transformative way. Are we just reproducing more of the same we learned during the past years? Here I presented some experiences of working with traditional communities, also with a large and mixed group of academic researchers. The research context I presented here has been developed in collaboration with the community over the past 9 years, resulting in many fruitful outcomes. The pathway is not linear; rather, it resembles spirals where we work together to understand how to adapt our researcher's minds to include diverse perspectives in the process. I consider this to be a successful experience because we can observe the deepening of relationships and their growing strength. We can see the community becoming increasingly engaged in the research we have been conducting and finding safe spaces to voice their desires.

I reinforce the importance of self-reflection as researchers about the development of our projects and interactions with other stakeholders. How important is it to have a non-academic repertoire when working with transdisciplinarity? What about incorporating literature from local ancestors, from indigenous peoples, rich with wisdom often overlooked in Western academia? When we write about our lived experiences and emotions, when we write from our own skin, we are expressing a deeper truth. We are engaging in what Conceição Evaristo calls *escrevivência*, in English akin to a written experience. The importance of bringing this discussion more often to academia, as something cyclical, as proposed by Nego Bispo (2023) - start-middle-start instead of start-middle-end. Trying to keep finding the headwaters, tributaries and mouth of all these different types of knowledge and societies to create something bigger and better. The idea of confluence by Nego Bispo was not initially intended as an academic concept for transdisciplinary researchers. It is rooted in the core principles of quilombo philosophy. Taking inspiration from Nego Bispo's writings for transdisciplinary research highlights not only the practical but also the political challenges of facilitating confluences of knowledge between actors with vastly different backgrounds and positions of power. His notion of confluence of knowledge therefore presents both an opportunity but also a challenge for fostering a more horizontal, equitable, and community-oriented approach to transdisciplinary research.

Acknowledgements

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COMMUNITY NOTE

The state of the Knowledge Management for Development (KM4Dev) community in 2024

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This Community Note reviews, for the first time, the annual activities of KM4Dev, taking the year 2024. We start with the top ten KM4dev buzzwords in 2024. Then we review KM4Dev's known impact on sustainable development, focusing on the advocacy campaign to successfully influence the text of the UN's Pact of the Future. Next, we provide an overview of KM4Dev's core activities: interactive platforms, knowledge cafes, the Youth Leadership Forum, the KM4Dev-SIKM peer mentoring programme, and the *Knowledge Management for Development Journal.* In the next section, we provide an overview of the people who have played a formal role in the community as members of the core group and we also celebrate the awards and academic achievements of our members. Then, we highlight some important activities: the face-to-face meeting which took place in Cape Town, South Africa in January, the support to the development of the fourth, forthcoming edition of the 'Agenda Knowledge for Development', new development around the KM4Dev 'Knowledge Sharing toolkit', and some key events in the knowledge management and KM4Dev calendar. Finally, we outline plans to celebrate the 25th anniversary of KM4Dev in 2025in the '25 years together' campaign.

Keywords: annual review; Knowledge Management for Development; communities of practice; 2024; events; advocacy campaign; United Nations

1. Introduction

This annual review highlights key issues and activities within the Knowledge for Development (KM4Dev) global community of practice in 2024. It showcases how the KM4Dev community continues to provide value to its members, driving transformation in knowledge management practices to address opportunities and challenges. These efforts span individual, collective, local, national, regional, and global levels, reinforcing the community's broad and meaningful impact. We should acknowledge that this is the first time that we have written such an overview and that it could still be improved further in future versions.

KM4Dev is a global community of practice of more than 1000 international development practitioners, researchers, consultants and policymakers. Its members are experts interested in knowledge management and knowledge sharing issues and approaches in sustainable development, and seek to share ideas and experiences in this domain.

2.   The top ten buzzwords/concepts that defined KM4Dev in 2024

The year 2024 witnessed significant strides in the practice of knowledge management for development (KM4D), but also underscored persistent concerns that demand attention. To capture these trends, we outline the top ten buzzwords or concepts that featured prominently in shaping the practice, discourse and research of KM4Dev during the year. Extracted from keywords featured on KM4Dev's social collaboration platforms, including the website, email threads and minutes of meetings, this list offers a glimpse into the complex issues facing the community and the pressing questions likely to persist well into 2025 and beyond. Many of these issues are reflected in the six generational framework of KM4Dev (Boyes et al., 2023).

2.1   Decolonization of knowledge
Decolonization of knowledge remains an important theme for KM4Dev and it was featured in 25 discussions on the KM4Dev online forum in 2024. Two questions appear to be key to this preoccupation, namely:

How to recognize and empower historically marginalized voices and knowledge systems?
How to address the dominance of colonial structures in global knowledge production?

2.2   Multiple knowledges
The call for multiple knowledges was a key part of KM4Dev and partners' advocacy campaign around the United Nations' Pact of the Future, entitled 'We need to urgently apply multiple knowledges to achieve the Sustainable Development Goals (SDGs) (Boyes, 2024a). You can find out more about this campaign in Section 3. The concept of multiple knowledges, which has been extremely influential in KM4Dev and beyond (Boyes, 2024b), was originally developed by KM4Dev member, Valerie A. Brown, and concerns the perspective that different types of knowledge and knowledge cultures (individual, community, specialised or expert, organisational, holistic) are needed to solve complex problems (Brown, 2010). However, others were also advocating for multiple knowledges in sustainability in the face of complexity (Boyes, 2023). For KM4Dev, this also reflects the need for additional multiple knowledges, such as tacit knowledge and local and Indigenous knowledge.

Key questions for multiple knowledges are:
How can knowledge management practitioners encourage mutual respect among different knowledge traditions?
How to enable the coexistence and collaboration of diverse knowledge systems?

For tacit knowledge, questions were related to:
How can organizations capture and share deeply personal or experiential knowledge?
What mechanisms are there to curb knowledge losses due to staff turnover or transitions?

For local and Indigenous knowledge, questionnaire related to:
How to integrate local knowledge systems in solving global problems like climate change?
How to ensure indigenous knowledge systems are respected, well utilized and protected?

2.3 Storytelling and shared experiences

For storytelling, outstanding questions and issues include:
How to capture personal narratives and collective experiences for better learning?
What KM approaches are there to strengthen emotional connections and community-building?

Capturing personal narratives and communal experiences for improved learning needs intelligent knowledge management (KM) approaches that emphasise inclusivity, diversity, and cooperation.

How to encourage individuals to maintain diaries detailing their work, problems, and lessons learned, regularly collecting and anonymizing these records to identify collective experience trends.

KM approaches, such as peer learning circles and co-creation practices, foster emotional connections and community-building by creating safe spaces for small groups to share experiences and solutions.

Indigenous knowledge integration involves integrating traditional ecological knowledge (TEK) into learning systems, ensuring the ownership and control by the knowledge holders.

2.4 Epistemic justice

This year saw two publications from members of the KM4Dev community on epistemic justice and its practical application. The first (Cummings et al, 2024a) provided an analysis of the relevance of the framework of epistemic justice to transdisciplinary research, arguing that 'it will increase fairness and justice as it relates to knowledge but also because listening and valuing the knowledge of all stakeholders will lead to better knowledge and more effective change processes.' This blog presents the theoretical framework of epistemic justice and will be followed up with an analysis of the implications for practice. The second (Cummings et al, 2024b) applies a new conceptual framework of epistemic justice, derived from the philosophical notion of epistemic injustice, to examine how these communities foster more equitable knowledge systems with regards to the social dimensions of sustainable development. Using critical discourse analysis, data from the websites of two scholarly communities of practice were analysed, revealing their innovative approaches to advancing epistemic justice through knowledge practices. The findings emphasize the utility of the epistemic justice framework in understanding the role of these scholarly communities

of practice in fostering social sustainability, specifically by contributing to more equitable knowledge practices.

Outstanding questions relating to whose knowledge is heard comprise:
How to promote fairness in the ownership, production, sharing, and use of knowledge?
What tools or methods are available to benefit vulnerable groups in knowledge-sharing processes?

2.5   Digital governance
How to address inequalities in access to digital technology/digital resources?
What strategies exist to ensure ethical and inclusive digital systems and equitable participation?

2.6   Partnerships and collaboration
How can collaboration across industries and sectors close critical knowledge gaps?
How can meaningful partnerships between public sector and non-state actors be encouraged?

2.6   Evidence-based policy development
How to integrate KM into policy and governance systems at local, national and global levels?
What role does KM play in creating adaptive, evidence-based development strategies?

2.7   Big data and AI
How to maximize AI to reshape knowledge creation, sharing, and application?
How to deal with ethical challenges and risks arising from use of AI for KM?

3.   KM4Dev's impact on global sustainable development

In this section, we highlight where KM4Dev, intentionally through advocacy efforts or less intentionally through its thought leadership in publications, has had a global impact. In 2025, we will be making more of an effort to map KM4Dev's impact at individual, organizational and global level.

3.1   Pact of the Future advocacy campaign
In 2024, members of KM4Dev played a pivotal role in advancing global sustainable development through its active engagement with the UN Sustainable Development Goals (SDGs) process. This began with participation in the Knowledge Management Global Network (KMGN) HacKMathon 2023 (Boyes, 2023), which explored innovative knowledge management approaches to tackle global challenges linked to the Agenda 2030 and the Sustainable Development Goals (SDGs) (UN, 2015). The initiative emphasized the importance of tacit, human-centred knowledge and identified gaps in its recognition by high-level UN processes. This also reflects a central premise of the Agenda Knowledge for Development (Brander & Cummings, 2018).

Building on these insights and the developing international agenda, members of KM4Dev collaborated with the RealKM Cooperative, owner of the *RealKM Magazine*, and the Knowledge for Development Partnership, an international non-governmental organisation based in Austria, to advocate for more attention to multiple knowledges in the SDGs in the process leading up to the development and ratification of the Pact of the Future at the UN Summit of the Future,[1] held in September 2024. In a campaign lead by Bruce Boyes of RealKM and KM4Dev, several impactful advocacy efforts were undertaken, including:

3.1.1   The Open Letter

The 'Open letter to United Nations and world governments in regard to Summit of the Future and Pact for the Future' (KM4Dev et al, 2024) was written in March 2024 in which:

> *We, the undersigned of the Knowledge Management for Development (KM4Dev) community, RealKM Cooperative Limited, and Knowledge for Development Partnership (K4DP), urge the United Nations and its Member States to acknowledge the critical role of multiple knowledges (encompassing local, tacit, experiential, community, and Indigenous knowledge) in achieving Agenda 2030 and the Sustainable Development Goals (SDGs). The international community must urgently recognize the significance of multiple and diverse knowledges for sustainable development, or the SDGs risk failure.*

This Open Letter was signed by more that 130 knowledge management professionals from across the globe. Additionally, a paper addressing the role of libraries and archives towards achieving the SDGs was prepared and published as another contribution to the joint RealKM-KM4Dev-K4DP campaign activities (Kenga et al, 2024).

3.1.2   Campaign for editorials in scientific journals

Aiming to replicate a successful campaign from health journals in which multiple, simultaneous editorials were used as a platform to raise attention for important global health issues related to climate change and nuclear risk (Zielinski, 2024), the team contacted editors of 30 knowledge management journals, 16 development studies' journals, and 12 information society journals. Our campaign was less successful that the health campaign and responses from editors in the knowledge management and development sectors indicated that they were less willing to undertake advocacy efforts. This was particularly disappointing in the international development sector given that '…the complexity and urgency of world development problems require direct assumption of responsibility from the [development studies] community. This implies that scholars and practitioners explicitly engage in exploring problems and solutions in partnerships with the communities and policymakers involved' (Basile & Baud, 2019: 7-8). This unwillingness to engage in advocacy on the part of the journals is also consistent with earlier observations that development studies' journals objectify rather than participate in development (Cummings & Hoebink, 2018).

Despite these challenges, we were successful in publishing a landmark editorial in the *Knowledge Management for Development Journal* in English (Al-Shorbaji et al, 2024a) and Spanish (Al-Shorbaji et al, 2024b) urging world leaders to integrate knowledge management approaches into the SDG agenda. This editorial was also published in the *Information Impact: Journal of Information and Knowledge Management* (Al-Shorbaji et al, 24c).

3.1.3 *Participating in multiple events*

The team and other members of KM4Dev participated in multiple preparatory events and at the Summit of the Future, disseminating our campaign message. KM4Dev and K4DP also participated in UN-led preparatory civil society discussions in Nairobi and youth-focused sessions at the Summit of the Future. These efforts positioned knowledge management and multiple knowledges as an essential driver for achieving sustainable development, providing the groundwork for the fourth edition of K4DP's Agenda Knowledge for Development, supported by KM4Dev.

3.1.4 S*uccess of the advocacy campaign*

The advocacy campaign was successful although not to the extent that we would have liked. As a result of KM4Dev and partners' efforts, we were successful in influencing important changes to earlier versions of the Pact for the Future. Although we did not achieve our final calls for further changes to the Pact for the Future and Declaration on Future Generations, we were successful in influencing important changes to earlier versions of the Pact for the Future through our open letter and submission, journal editorial (Al-Shorbaji et al, 2024a, 2024b and 2024c), multiple knowledges explainer, and libraries and archives paper. The word 'knowledge' had appeared only twice in the original January 2024 zero draft of the 'Pact for the Future' (Germany & Namibia, 2024), but now appears 18 times in the final Pact (UN, 2024). Significantly, the final Pact includes the following action reflecting our calls for the SDGs to protect and build on Indigenous, traditional and local knowledge, which had been completely missing from the zero draft.

> *Action 32. We will protect, build on and complement Indigenous, traditional and local knowledge.*
> *56. We recognize the need for science, technology and innovation to be adapted and made relevant to local needs and circumstances, including for local communities, traditional Afrodescendent populations, and Indigenous Peoples, in line with the principle of free, prior and informed consent, as appropriate. We decide to:*
> *(a) Foster synergies between science and technology and traditional, local, Afrodescendent and Indigenous knowledge, systems, practices and capacities.*

3.2   The IFAD evaluation and multiple knowledges

In December, the International Fund for Agricultural Development (IFAD) published its corporate-led evaluation of KM practices (IFAD, 2024), becoming the first UN agency to adopt the concept of multiple knowledges, and apply the conceptual framework of knowledge management for sustainable development in its knowledge management activities (Boyes et al, 2023). The

evaluation flags the importance of a knowledge agenda that can underpin IFAD's ambition to become a leader on rural transformation. It acknowledges the quality of the many technical knowledge products, but also highlights the need to connect multiple knowledges, including local and contextual knowledge, in order to achieve transformative action. IFAD's growing field presence, together with the tangible nature of its interventions, position it well as a broker of local and contextual knowledge. The Fund has successfully mobilized multi-stakeholder processes for knowledge generation and sharing in many countries. The evaluation recommends that IFAD should reclaim its role in elevating the operational knowledge to a global level, to inform the rural transformation debate. A lighter and more flexible knowledge agenda is recommended, with a focus on rural transformation and integrating multiple knowledges. The shift in emphasis would require transitioning from a centralized KM architecture to a model with devolved responsibilities and resources.

## 4. KM4Dev core activities

4.1 Collaborative platforms

KM4Dev's collaborative platforms, including the website[2], the Dgroups Foundation discussion forum,[3] the YouTube channel,[4] and the Knowledge Management for Development Journal[5] provide a space for practitioners and scholars to engage on a range of professional topics, including academic discussions, peer reviews, and recommendations.

4.2 Knowledge cafés

KM4Dev hosted a further six Knowledge Cafés in 2024 (Knowledge Cafés 32-37), each spotlighting critical themes in knowledge management, in cooperation with the key partner, *RealKM Magazine*. All knowledge cafes are open to non-KM4Dev members, representing a way in which KM4Dev aims to create value for all of the knowledge management and global development community. In an appreciation posted on the KM4Dev discussion forum (28 February 2024), Paul Atsu articulated the value of the KM4Dev knowledge cafes:

> *One of the knowledge cafes' greatest assets is its capacity to foster a strong sense of community among its patrons. In a world where loneliness and disengagement endanger well-being and productivity, knowledge cafes by KM4Dev offers a warm, inclusive environment where people may flourish. Through mutual experiences, cooperative efforts, and a common outlook, members discover not only career satisfaction but also a genuine sense of belonging.*

The attractive graphics for the knowledge cafes and the Zoom platform are provided by core group member, Rocio Sanz, for which we are very grateful. In addition, Rocio develops the videos of the sessions and posts them onto the YouTube channel.
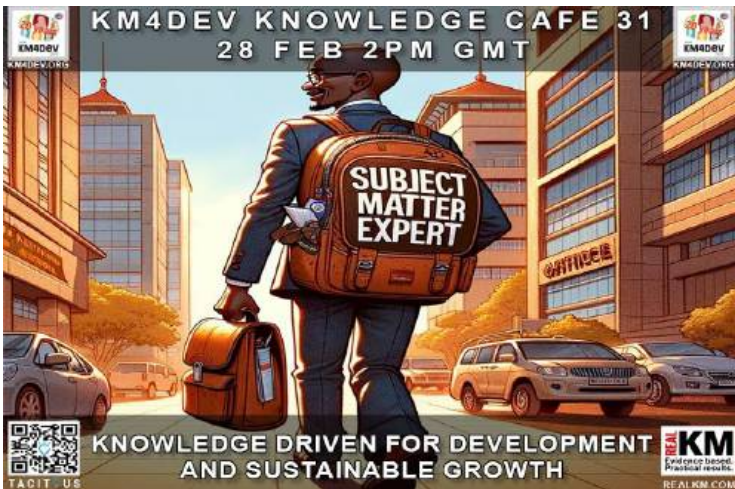
Knowledge Café 32, held in collaboration with Tacitous, explored 'Knowledge-Driven Development and Sustainable Growth.' The cafe considered knowledge as a catalyst for sustainable growth, lessons learned, critical knowledge retention through strategic knowledge management practices, and global case studies of knowledge management in action. Presenters were Jordan Richards, Information and Digital Solutions Technologist; and Darius Baria, expert in knowledge management and lessons learned, and the cafe was facilitated by Paul Atsu and Gladys Kemboi. At the session, we discussed knowledge strategies, tools and technologies that can scale up our community, organizations and countries towards sustainable growth and operational excellence. A video of the cafe can be viewed on KM4Dev's YouTube channel.[6]

Knowledge Café 33 focused on 'Mapping Local Knowledge for Sustainable Development,' emphasizing the value of local knowledge systems with speakers, Stacey Young, Epiphane Adjadji, Bruce Boyes, Charles Dhewa, Folasade Adepoju and Gladys Kemboi, facilitated by Denise Senmartin, and Rocio Sanz. This café had more than 200 registrations, demonstrating again the interest in local and Indigenous

knowledges in the KM4dev community. In a slightly different format than usual, we captured the deliberations and presentations in a mural.[7] We also have a short video[8] which does not, unfortunately, cover the whole session. The deliberations from the knowledge cafe will provide input into the new version of the 'Agenda Knowledge for Development' and particularly Knowledge Development Goal 3.

Knowledge Café 34 (27 May 2024) was a collaborative write-shop to develop personal statements to the 'Agenda Knowledge for Development' 4th edition (Brander & Cummings, In Press). To empower new contributions, K4DP hosted this interactive write-shop with Madina Ba from K4DP facilitating and Andreas Brander, Managing Director of K4DP, speaking. In this write-shop, participants were taken through a step-by-step process to support them to articulate their personal perspectives into clear, compelling personal statements for inclusion in the updated Agenda.[9]

Knowledge Café 35 (4 June 2024) was organized in collaboration with the World Bank's Community Builders community of practice, and featured leading experts who have shaped the 'Knowledge Silo Breakers,' a cornerstone in the Bank's journey to promote collaboration and innovation through CoPs. The session was hosted by Claudia Teixeira and Zarko Palankov, former members of the World Bank's CoP team 'Communities Reinvented', the same team behind our previous session on the *World Bank CoP Toolkit*.[10]

Knowledge Café 36 (27 June 2024) co-organized with the Global Health Knowledge Collaborative, featured a panel discussion on 'Person-to-Person: Regional and Country-Level KM Approaches from the Global Health Sphere' sharing peer-to-peer insights from Jordan, Nigeria, Francophone Africa, and Asia, with contributions from University Research Company (URC)-Centre for Human Services (CHS), Jhpiego, and the Johns Hopkins Centre for Communication Programs (JHCCP), USA.

Knowledge Café 37 (7 August 2024) explored leveraging generative AI and knowledge for skills

development, with lessons from a World Bank community manager and graduate student experiences in Africa. Judith Perez, Skills GSG Community Manager, World Bank, Mexico shared strategies for leveraging knowledge sharing to boost skills development among development practitioners. Insights from global organizations on enhancing community management and engagement were considered. Adamu Abdullahi, Librarian and Knowledge Management PhD candidate, Federal University Dutse, Nigeria,

discussed how to discover Generative AI for skills development and explored key topics such as: opportunities for graduate students on how to use ChatGPT; and ethics and copyright issues in using ChatGPT.
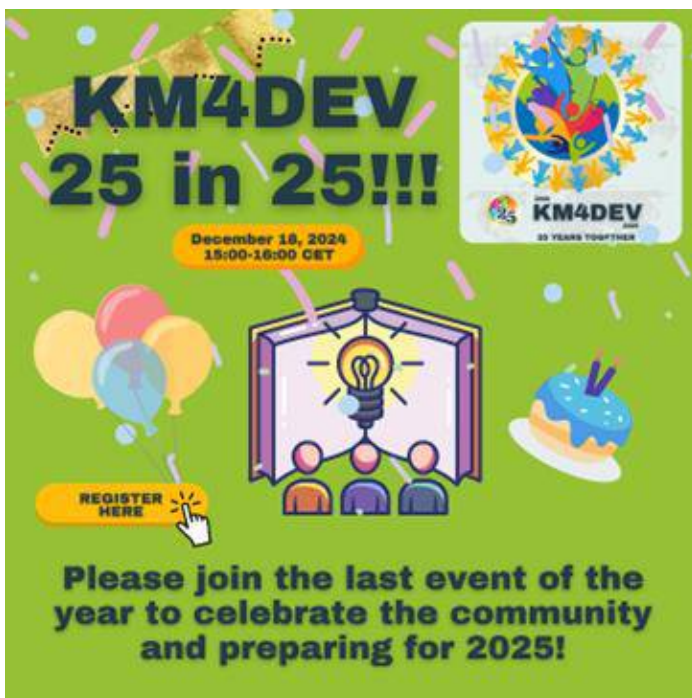
Knowledge Café 38 (18 December) was an end-of-year celebration and a brainstorming session as we planned for KM4Dev's 25th Anniversary Celebrations and explored ideas for our community.

4.4   The Youth Leadership Forum

The Youth Leadership Forum, now in its fifth year, continues to provide a platform for young and aspiring KM students and practitioners to connect, share their experiences, and collaborate. Six monthly meetings were conducted through which participants identified key challenges, mapped out priorities, and developed an agenda to enhance youth participation and involvement within the broader KM community. Moreover at the UN Summit of the Future during the session on Empowering youth for sustainable futures: intergenerational responsibility and skills for a just transition', the Youth Leadership Forum, co-led by Paul Atsu, provided 7 key actions which was presented at summit by Fitsum Habtemariam.

4.4 The KM4Dev-SIKM mentoring programme

In February 2024, the KM4Dev and SIKM Leaders Community[11] presented a six-month pilot KM Peer Mentoring programme designed for practitioners across their communities. This initiative paired 15 mentees with 8 experienced mentors, creating a space for real-time, personalized guidance. The programme demonstrated that there was a strong need for such support, as mentees gained practical knowledge while mentors found satisfaction in volunteering their expertise. Encouraged by the pilot's success, the initiative expanded into a 12-month programme , aiming to further enhance professional growth and collaboration within the knowledge management community. In March 2024, the programme made a call for more mentees and mentors, receiving 93 applications and 51 mentors who are able to take 70 of them.

4.5 The Knowledge Management for Development Journal

The open-access *Knowledge Management for Development Journal*, supported by the KM4Dev community, published the first issue of its 18th volume in 2024.[12] The first issue in the volume included the two editorials highlighting the importance of multiple knowledges for sustainable development (Al-Shorbaji et al, 2024a, 2024b). This editorial calls on the United Nations, political leaders, and development professionals to recognize explicitly that knowledge and knowledge management are of key importance to the achievement of the Sustainable Development Goals (SDGs) and the 20230 Agenda for Sustainable Development, and to adopt the knowledge-based goals of the 'Agenda Knowledge for Development' (Brandner & Cummings, 2018). This editorial is being published simultaneously in knowledge management and development journals around the world, calling for change at a time when the UN is revisiting the SDGs at the Summit of the Future in September 2024.

The first of four articles, 'Knowledge sharing to improve the sustainability of food systems in West Africa: lessons learned from the Food Systems Caravan' (Sousa et al, 2024) describes a project that brought together policy makers, researchers, farmers, extension officers, students, non-governmental organizations (NGOs) and other stakeholders in a series of events to promote learning, knowledge sharing and dialogue in Benin, Burkina Faso, Ghana, Mali, and Nigeria for a shared understanding of the challenges and solutions to West Africa food systems. The second, 'Capacity development for scaling conservation agriculture in smallholder farming systems in Latin America, South Asia, and Southern Africa: exposing the hidden levels' (Woltering et al, 2024), provides examples of the organizational, cooperation and enabling environment levels of capacity development, drawing on four projects implemented by the International Maize and Wheat Improvement Centre (CIMMYT) to scale conservation agriculture practices to smallholder farmers.

The third paper, 'Outcome-oriented multi-stakeholder network design: four innovation spaces to accelerate food system transformation' (Koerner et al, 2024) builds a framework on outcome-oriented network design to identify four different network designs which emerge from a framework of ten design variables, each with different characteristics. The fourth article 'Insights on scaling of

innovations from Agricultural Research for Development: views from practitioners' (Woltering and Boa-Alvarado, 2024) undertook 36 interviews to establish that the dominant understanding of scaling was output and beneficiary-focused, rather than outcome and society focused as the latest literature suggests.

Following the papers, we have a contribution to the 'Tools and Methods' section, 'What is integral knowledge management and why do we need it? How the Spiral Dynamics model can help us overcome polarized perspectives on knowledge management within organisations' (Schunter, 2024). This contribution proposes that some of the key challenges of knowledge management in organisations stem from the fact that different people in organisations are operating from different worldviews and subsequently different understandings of knowledge. In this contribution, Johannes Schunter identifies five worldviews to knowledge management: the magic view (knowledge provides identity and belonging), the hero view (knowledge is power), the absolutistic view (knowledge is order and truth), the modern view (new knowledge is the driver of success) and the pluralistic view (everyone's knowledge is precious). He proposes that a sixth, integral view of knowledge, namely that knowledge is complex, multi-faceted and always changing, draws on the strengths of all other worldviews, address frictions and conflicts that often arise in organisations with diverse perspectives on knowledge management. This resonates with Valerie A. Brown's perspective on multiple knowledges (Brown, 2011), mentioned previously in this overview.

The final contribution, also part of 'Tools and Methods', 'A conversation tool for civility and knowledge integration: "a conversation model that combines dialogue and (self)facilitation for civility and creativity in a fragmented world" ' (Pugh and Altmann, 2024) describes the Five Discussion Disciplines (5DD) model for productive conversations, illustrating conversation impacts through examples, dos and don'ts, and case studies; and providing action strategies for individuals and leaders.

5. Participants in KM4Dev

5.1 The KM4Dev Core group

During the year, KM4Dev's core group, namely a volunteer group of community members acting as a steering committee under the leadership of Sarah Cummings, continued to meet monthly to plan for activities to maintain and grow the community, and to service members' needs. Other support teams included an ICT Working Group, led by Davide Piga; a sub-group advancing multiple knowledges and decolonization of the SDG agenda, led by Bruce Boyes; members of the monthly volunteers and moderators, led by Nancy White; and members of the Knowledge café team, led by Gladys Kemboi, Rocio Sanz and Paul Atsu. Members are thanked for the dedication and selfless contributions.

Current members of the core group include new members of the team who joined in 2024 or early 2025:
Paul Atsu

John Hovell
Omar Faroque
Zacharia Moseti
Katrina Pugh
Jordan Richards

Long-standing members comprise:
Sophie Alvarez
Bruce Boyes
Andreas Brandner
Jorge Chavez-Tafur
Sarah Cummings
Charles Dhewa
Samirah Faruk
Alok Goel
Ginetta Gueli
Fitsum Habtemariam
Srividya Harish
Gladys Kemboi
Maureen Kenga
Jacob Løfdahl
Christina Merl
Nana Mgbechikwere Nwachukwu
Pier Andrea Pirani
Ninez Piezas-Jerbi
Davide Piga
Cesar Robles
Reza Salim
Rocio Sanz
Denise Senmartin
Toni Sittoni
Jasmin Suministrado
Dydimus Zengenene
Chris Zielinski

Simone Parrish left the core group at the end of 2024. On behalf of the KM4Dev community, we would like to thank you, Simone, for your important contributions. And thank you, too, for all of the members of the core group and their work for the KM4Dev community.

5.2   Celebrating our stars
Many KM4Dev members made substantial professional achievements, including awards and academic achievements. In alphabetical order:

Benjamin Abugri, Knowledge Management, Digitalization and Learning Lead Specialist, Forum for Agricultural Research in Africa (FARA), Ghana.
Award: International Knowledge Management Award (2023) from KM Austria and K4DP
Benjamin describes his experience of receiving the award (Abugri, 2024) and it has also been featured in Ghanaian news where it has been noted that he is the second African recipient of this award (Citi Newsroom, 2025). Core group member, Charles Dhewa, was the first African recipient of this award.

Ivett Bene, CEO of C-SYNC & Exclusively You.
Award: Knowledge Management Training CEO of the Year 2024 and Excellence Award in Internal Communication 2024, EU Business News

Andreas Brandner, General Manager, Knowledge Management Austria, KM4Dev and Knowledge for Development Partnership.
Award: Individual Social Responsibility Leadership Award 2024, ISR Leadership

Stan Garfield, author, speaker, community leader and founder of the SIKM Leaders Community.
Award: KM Community Award 2020, KMWorld (Ojaya, 2024). Patrick Lambe presented the award, congratulating Stan Garfield on his ability to keep the knowledge community connected and on decades spent creating a knowledge infrastructure for the community in a video message.[13]
Award: 2024 iSchool Friend of the Year, School of Information, Kent State University, USA, for having made a significant contribution to the iSchool.

Gladys Kemboi, PhD Student, University of Illinois, Urbana-Champaign, USA
Award: 2024 Digital Preservation Coalition (DPC) Fellowship Award for her distinguished contribution to securing digital legacy to advance local and Indigenous knowledge in development in Kenya and across Africa (School of Information Sciences, 2024).

Obinna Richfield Anah, Lead, Knowledge Management, Communications and Visibility at the African Ministers' Council on Water (AMCOW)
Award: Knowledge Manager of the Year 2024, CILIP: The library and information association, UK

Phomolo Lebotsa, Knowledge Management Officer. Wool and Mohair Promotion Project (WAMPP), Lesotho
Educational achievement: PG Diploma: Knowledge and Information Systems Management, University of Stellenbosch, South Africa.

Stacey Young, PhD, Chief Knowledge Officer, US Agency for International Development, USA.
Award: International Knowledge Management Award (2023) from KM Austria and K4DP

Chris Zielinski was inducted into the Internet Protocol version 6 (IPv6) Hall of Fame in December 2024 as an early commentator on social and ethical aspects of IPv6 by the International Federation of Information Processing (IFIP) (IFIP, 2024).

6. Other highlights of KM4Dev community activities

Although not exhaustive, the following member activities highlight the vibrancy of the KM community during 2024:

5.1 Face-to-face meetings
In January, South South North[14] and the Climate & Knowledge Development Network hosted a micro-meeting with KM4Dev in Cape Town, South Africa, for networking and knowledge sharing.

5.2 Agenda Knowledge for Development
In March, the Wageningen Centre for Development Innovation (WCDI), Wageningen University & Research, The Netherlands, proposed a Knowledge Agenda to build food systems resilience in the Horn of Africa (Cummings et al, In press; Cummings and van Uffelen, Under submission), providing a long-term vision for managing food crises and building on the third edition of the 'Agenda Knowledge for Development' (Brandner & Cummings, 2018), elaborated and published by the key KM4Dev partner, the Knowledge for Development Partnership (K4DP).

Towards the end of 2024, K4DP started work on the fourth edition of the 'Agenda Knowledge for Development' which will be published in January 2025. Like the previous editions of the Agenda, this version will include even more personal visions of knowledge societies and the SDGs, many of them coming from KM4Dev members.

5.3 Knowledge sharing toolkit
The KM4Dev 'Knowledge sharing toolkit' was originally developed from 2005 onwards on a wiki with the CGIAR and the Food and Agriculture Organization of the United Nations (FAO) (Staiger, 2008). It is collective work, based on former project work, as well as on many resources, previously developed by CARE and the Overseas Development Institute (ODI). The toolkit has three main pieces:
1. A library of tools, meaning web-based software (e.g., blogs, wikis, instant messengers, podcasting) and offline physical tools that can be used with a variety of methods.
2. A library of methods, meaning group processes that people can use to interact with each other, online or offline (e.g., appreciative inquiry, storytelling, knowledge fairs).
3. A set of perspectives and guidance that can help users choose tools and methods for their needs and contexts. Some examples: How can I organise meetings differently? How can I plan, monitor, and evaluate my activities/projects? How can I improve relationships and collaboration between regional offices and the headquarters?

The original website of the toolkit was lost to KM4Dev but Sophie Treinen of the FAO and Davide Piga are in the process of 'rescuing' the lost files from the Internet Archive[15] and uploading them into Google documents. Finishing this process will require support from the KM4Dev community and it is planned to hold a hackathon in February 2025. At the hackathon, participants will be shown how to upload the existing documents into the new format and will do this in real time. Once the upload is completed, we will be looking at additional tools which can be added.

5.2   Key events in the knowledge management for development calendar

The Forum for Agricultural Research in Africa (FARA) held its 4th Knowledge Management for Agricultural Development Challenge (KM4AgD)[16] from March to August, including knowledge cafes and mentorship for knowledge management practitioners. In May, Johns Hopkins Bloomberg School of Public Health (BSPH) offered a course on 'Knowledge Management for Effective Global Health Programs.' The 2024 Midwest Knowledge Management Symposium took place in June, and the KM Global Network hosted Global Knowledge Week in October.

In August, the Convention on Biodiversity started its first KM4Biodiversity Challenge with a training for all 196 countries, altogether 600 participants from various stakeholder groups per country participating. A regional GRULAC KM4B Workshop tool place in Bogota in October 2024. Lead instructor for the KM4B Challenge is KM4Dev´s core team member, Andreas Brandner.

In December, K4DP held its annual KM awards ceremony, honouring two individuals and two organizations for their contributions to KM for sustainable development. Annually since 2009, the international Knowledge Management Award is bestowed upon an international organization as well as an outstanding personality. The KM Award was constituted under the auspice of the Association Knowledge Management Austria and since 2018 the KM Award is given in partnership with K4DP. Individual winners of the award are recognised in the previous section, while institutional winners were the World Food Programme and the World Bank.

Throughout the year, KM4Dev sought to strengthen connections with the major organizational KM groups Global Think-Tank of Organizational Tacit Knowledge Management (GO-TKM)[17] and the Knowledge Management Global Network (KMGN)[18]. It continues its important partnership with *RealKM Magazine* which celebrated more than 2 million article views and the publication of its 2,000th article in 2024.

7.   KM4Dev 25 in 25!

KM4Dev is gearing up to celebrate its 25th anniversary in 2025 with exciting initiatives to engage and benefit the community. Proposed ideas include:
a) a possible face-to-face meeting of KM4Dev members, potentially aligned with another relevant conference to cut on costs. avoid costly locations or peak tourist seasons;

b) a skills gateway and exchange platform to facilitate short online sessions for members to share and learn from each other, and which could complement the peer mentorship program;

c) a new website which is more directly derived from the online platform provided by the Dgroups Foundation[19];

d) online events with other networks;

e) a hackathon and re-launch of the KS toolkit;

f) and many more to be discussed with the KM4Dev community.

These plans reflect KM4Dev's continued commitment to fostering collaboration, learning, and growth within its vibrant network. It will be celebrating with the *Knowledge Management for Development Journal* which has been running for 20 years and with *RealKM Magazine* which has been running for 10 years.

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