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Mapping Commons and their Interactions with Communities: Insights from the Chilika Lagoon in Odisha, India

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V2V Working Paper Series

V2V Global Partnership "Working Paper Series" aims to facilitate the exchange of ideas, mobilize knowledge, and generate broad-based discussions on vulnerability-viability themes within the context of small-scale fisheries. The Working Paper Series will provide a collaborative and interactive platform for academics, practitioners, representatives of civil society, and individuals interested in making written contributions to the theoretical, methodological, practical, and policy aspects of small-scale fisheries, both locally and globally. To contribute to the V2V Working Paper Series, please contact v2vglobalpartnership@gmail.com.

Reflections from Chilika - V2V Field School

Small-scale fisheries (SSF) are important social-ecological systems across all parts of the world. Strongly anchored in local communities, SSFs reflect a way of life, and they provide critical contributions. Yet, their efforts and their existence are often overlooked as many SSF communities remain economically and politically marginalized, are highly vulnerable to change, and remain invisible in policy debates. Nonetheless, the continuity of many SSFs suggests certain strengths and forms of resilience. A holistic understanding of what causes vulnerability, as well as what makes fisheries social-ecological systems viable and through what processes is required. This understanding needs to be place-based and situated within the SSF context, and the processes surrounding it must be long-term, collaborative and iterative.

The Chilika - V2V Field School aims to provide a creative platform for graduate students and early career scholars and practitioners to deliberate and learn about concepts, approaches and methods helpful to achieving transitions from vulnerability to viability within SSF social-ecological systems. The Field School takes place every year in the Chilika Lagoon, Bay of Bengal, India, where participants gain firsthand experience and creatively engage in furthering their understanding and knowledge of vulnerability to viability transitions, and experiment with concepts and approaches that are novel, transdisciplinary and problem oriented. The Reflections from Chilika - V2V Field School is part of the V2V Working Paper Series that exclusively focuses on documenting the main learnings, insights, reflections gained by the Chilika - V2V Field School participants during their weeklong journey with the fisher communities of Chilika Lagoon.

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1. Introduction

The need to understand 'global and micro-level commons' (herein characterized by low-excludability and high subtract ability), has gained traction over the past decades. This is partly because extractive processes and encroachment increasingly threaten the common, marine and terrestrial shared spaces, resources, and systems (Dias et al., 2023; Velicu & Garcia-Lopez, 2018; Bollier & Helfrich; 2014; Moor, 2011; Ostrom, 1999). In most vulnerable natural-resource settings and contemporary policy analyses, it is explicitly documented that commons (shared) are becoming 'uncommon' (exclusive) (Arizi et al., 2024; Bharti et al., 2024; Velicu & Garcia-Lopez, 2018; Barratt & Allison, 2014; Moor, 2011; Ostrom, 1999). The disempowered community spaces, fragmented governance, and co-management systems have partly worked in proliferating common-pool resources' vulnerability to anthropogenic-environmental threats (Dias et al., 2023; Velicu & Garcia-Lopez, 2018). This signals a need for a rethink of existing practices, policies, and research perspectives on commons, across scales (Matovu et al., 2024a; 2024c; Dias et al., 2023; Wells et al., 2020; Velicu & García-López, 2018; Barratt & Allison, 2014).

The ramifications of exclusion in the access/utilization of commons and the complexity of drivers that increase the vulnerability of commons in micro-level geographies have been dire (Dias et al., 2023). Worst-case scenarios are being reported among the already vulnerable coastal zones and livelihood sectors, such as small-scale/coastal fishing (Matovu et al., 2024b; Nair & Nayak, 2023). Several case studies have found that socio-ecological grief and livelihood insecurity among fishing communities have increased due to escalating 'elite capture' of formerly shared commons in most resource-rich zones (Dias et al., 2023; Wells et al., 2020; Velicu & Garcia-Lopez, 2018). This is worsened by unforgiving and devastating environmental shocks, such as climate change-induced biodiversity shifts/declines (Matovu et al., 2024b; Pradhan et al., 2022; 2023). This unsustainable facade (involving the limited understanding of 'micro-commons'), births a typology of questions/dilemmas that could be asked to gauge our understanding of commons: (a) how do those who depend on micro-commons recognize and define them?; (b) what are the linkages between interconnected micro-commons and how are they managed?; and (c) how can viable transitions that aid shared visions and trust-building in the usage/management of micro-commons be charted?

Understanding the complexity and vulnerability of commons and common-pool resources in different regions could be a viable approach to developing sustainable solutions. (Dias et al., 2023; Wells et al., 2020). Unfortunately, how to chart this; has (un)surprisingly remained largely unexplored (Matovu et al., 2024a; Dias et al., 2023; Barratt & Allison, 2014). Drawing from the narratives of riparian communities around Lake Chilika in Odisha, India, this paper attempts to map commons, based on the reflections from five coastal communities; herein referred to as sub-systems, around Lake Chilika. By viewing commons as a part of a complex and nested adaptive system, possibilities of identifying micro-level system dynamics and polycentric governance system interactions, that either inhibit or enable vulnerability to viability transitions could be identified (Matovu et al., 2024c; Pradhan et al., 2022; Wells et al., 2020; Barratt & Allison, 2014). This can further help in the generation of critical unexplored citizens' knowledge on co-management, comprehension of socioecological system interactions, and integrated conservation initiatives, which are urgently needed to avert de-commonisation processes (Wells et al., 2020; Velicu & Garcia-Lopez, 2018; Nayak, 2021).

To succinctly contextualize the qualitative information and highlight the interactions in different subsystems around Lake Chilika, we first, provide a preamble on Lake Chilika, outlining its ecological and economic endowments. Second, we identify the commons present in each sub-system. Third, we map the interactions within these sub-systems, including an in-depth analysis of their dynamics. Following this, we generate a comprehensive system map of Lake Chilika, capturing the nature of these interactions, reflecting on whether they are direct or indirect, and their positive or negative influences overall, around the Chilika system. Finally, to situate these findings within the broader regional and global policy discourse on vulnerability and viability transitions, an explicit reflection on the situational indicators relevant to Lake Chilika's sustainability is made. This includes a novel conceptualization of what defines a common resource in a shared environment, such as Lake Chilika.

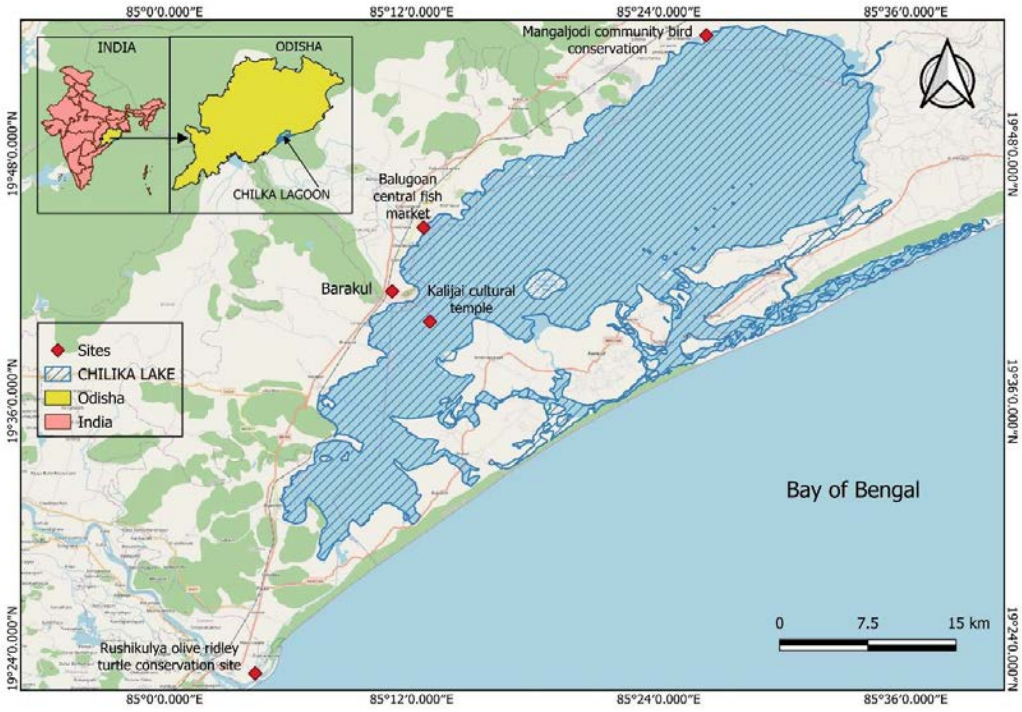
2. Place, people and methods

2.1 Overview of Chilika as a place of learning

Lake Chilika (synonymously called Chilika Lagoon) is the second-largest coastal lagoon globally, and the largest brackish lagoon in Asia (Nair & Nayak, 2023; Kumar and Pattnaik, 2012). The lagoon is situated along the coastline of Odisha in the districts of Puri, Khurda, Nayagarh, and Ganjam in the eastern part of India (Kumar & Pattnaik, 2012) (*Figure 1*). Chilika is a unique biodiversity hotspot and is a critical part of the Bay of Bengal, with several rivers, such as Daya and Mahanadi flowing into the bay (Arizi et al., 2024; Nair & Nayak, 2023) (also see www.chilika.com). Due to its unique biodiversity and socio-ecological functions, in 1981, the Chilika Lagoon was listed as a Wetland of International Importance, i.e., Ramsar Site (Nair & Nayak, 2023; Ramsar, 2012). The spatial size and depth of the Chilika Lagoon vary depending on the season (monsoon or dry) (Nair & Nayak, 2023), although it is reported that the area of Chilika Lagoon is 64.3 kilometres (horizontal extent) and 20.1 kilometres (in width) (Nair & Nayak, 2023; Kumar & Pattnaik, 2012).

Figure 1

Map of Lake Chilika and the five coastal communities/riparian areas visited to identify and gain micro-level narratives on the commons



Source: Baker Matovu

Additionally, Chilika Lagoon is endowed with several unique capitals, goods, and services, such as fish (Nair & Nayak, 2023). Such endowments have made Chilika Lagoon a beehive of livelihood activities (Bharti et al., 2024; Arizi et al., 2024), with more than 400,000 fisherfolk operating around the Lagoon (Nair & Nayak, 2023). The presence of over 700 plant species, 800 animal species, and unique lush wetland vegetation, has made Chilika a spawning and habituation site of some of the largest congregations of migratory bird species globally (CDA, n.d; Nair & Nayak, 2023). This has led to increased eco-tourism, conservation, and boating among others. The Chilika Lagoon further forms a unique cultural bond with the people of Odisha, based on the legend of King Raktabahhu and the Kali Jai temple (CDA, n.d). Of recent however, there has been an increase in environmental-human vulnerabilities around Chilika Lagoon that may lead to resource contentions and micro-level community exclusion (regarding the historically shared resources in the Lagoon) (Bharti et al., 2024; Arizi et al., 2024; Nair & Nayak, 2023; Nayak, 2017). An urgent understanding of this emerging unsustainable façade is needed.

2.2 Procedure for generating narratives and reflections

This experiential learning exercise was conducted through participatory interactions and observations with communities around Chilika Lagoon. Interactions and observations were conducted in five communities/areas: (i) Balugaon Central Fish Market, (ii) Barakul village, (iii) Mangalajodi community-managed bird conservation site, (iv) Kalijai cultural temple, and (v) Rushikulya Olive Ridley Turtle Conservation site. The main target was identifying micro-level commons within/around the Chilika lagoon, analysing their interactions, and exploring perspectives and narratives among those who shape them.

The narratives obtained from the micro-level communities mapping (using a systems mapping approach) highlight the interactions/system relationships between the different actors around Chilika Lagoon. This included an exploration of the critical resources for community livelihood and ecosystem welfare. A sub-system map is drawn for each of the five communities to generate a coherent synthesis and reflections on the nature of vulnerability or viability of a given community. This is further scaled up by creating a general system map for the Chilika lagoon that shows the nature and ramifications of the interactions in the micro-level system, in the context of environmental governance and transitions from vulnerability to viability.

3. Narratives and reflections

This section incorporates three aspects: (i) a preamble about a given community system (ii) interactions and interrelationships in the current livelihood activities, and (iii) reflections on the systemic issues/indicators of vulnerability or viability in each community.

3.1 Sub-system 1: Mangalajodi community

How long does it take two beings to understand each other's value?
Between one who is introduced and one who is as old as a place.
Birds on their backs. Grazing slowly. A moving watchtower to rest tired wings.
Is this symbiosis?
Hidden hooves shape the floor. Hiding bugs picked from fur.
Do they know the difference between nests and food?
Between what's for them and what is not.
Oblivious to the damage they may cause.
Or maybe just uncaring.
...
Rainbow-coloured water surrounds the boats as we watch the buffalo and birds.

Figure 2

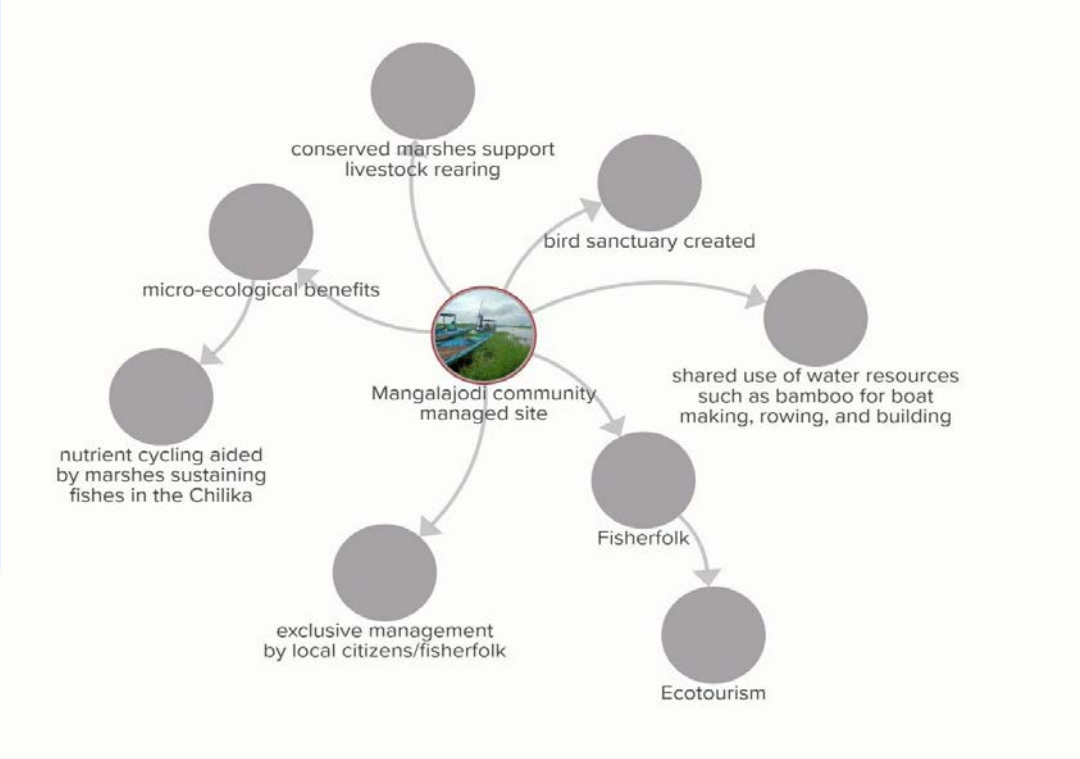
A local boatman navigates the serene waters of Mangalajodi

Source: Duncan Willis

Mangalajodi is situated in the northwestern part of the Chilika lagoon (See *Figure 1*). The community has a unique community-managed wetland, and the social-ecological system interactions therein are traced to several decades ago. The developed Mangalajodi community conservation area currently serves as the main 'commons.' Most parts of the natural ecosystem have set the foundation for synergetic livelihood activities and settlements that heavily depend on the marshes. The foundational components of the ecosystem include birds, fish, plants, water, air, and nutrients, among others. The micro-level system avails critical services and goods that interplay through complex, but well-understood relations that balance in equilibrium when operating in a vacuum. Some of these services and relations include predator-prey interactions, habitat construction, and nutrient cycling. Alongside this 'natural' system is the interjection of humans and their creations which include, buffalo herds, boats, waste, permanent settlements, and other infrastructure. The co-existence of the natural and human systems was mainly observed through the symbiosis of activities, such as tourism, agrarian/pastoralist practices, and fishing. *Figure 3* succinctly highlights the intricate system dynamics in Mangalajodi.

Figure 3

The key sub-system dynamics and their interaction/relationship in Mangalajodi.



Source: Baker Matovu

3.1.1 Reflection(s) on Human Activities and their Relationship with the Natural System

Tourism is only a recent addition to the Mangalajodi ecodevelopment site but has been prosperous for its operators and community. The 'eco-tourism' industry in Mangalajodi is directly reliant on the wetlands area due to its status as a migratory bird hotspot. The millions of birds that stop over or nest there draw in tourists. Thus, the earnings from tourism are directly related to the conservation and protection of the birds' habitat. These earnings also trickle into the community and increase other economic investments in the area.

Agrarian/pastoralist activities occur directly within and outside of the marsh making them a semi-dependent relationship. Herders utilize the marsh for grazing their water buffalo because it is freely accessible and nutrient rich. The herders benefit from the area because of its low operation costs. The buffalo provide value through nutrient cycling through their consumption and waste creation, and aeration as they wade through the waters.

Fishing activities occur within and outside of the marsh area, representing a semi-dependence. Throughout the conservation area, small nets can be found alongside water channels. The passive practice supplements many tour operators' incomes as fish can be sold or consumed. Boats from the community also use some of the waterways connecting the marsh to the main lagoon. The fishers may provide stock management while the marsh provides the fish as well as protection from weather to their moored boats.

3.1.2 Reflection(s) on the Impacts of Interactions

The largest recent impact of human activities has revolved around the conversion of the marsh from hunting grounds to a conservatory. The wetlands, due to their immense bird population, were earlier used as hunting and fishing grounds, likely leading to a decline in populations over time as the extractive practices occurred. The positive changes to the marsh have been three-fold. First, the shift to conservation has effectively sustained or increased biodiversity within the area. This may equate/evolve into higher levels of future resilience in terms of both natural and human systems. Second, economic activity has increased and benefited the community through its tourism activities while also attracting new external investments and support from private and public entities. Lastly, these efforts have reinvented the community's reliance on the marsh, thus shifting and sustaining positive relations between the interlinked systems.

3.2 Sub-system 2: Barakul community

Barakul, a small fishing village on the western shore of Chilika Lake, sits quietly at the heart of an intricate landscape. Its people, bound by generations to the lagoon, are defined by the ebb and flow of the waters. Barakul is a living story of a community stitched together by fishing nets, cultural ties, and the shared pride of calling Chilika their own.

Entering the village, one can't help but notice the interwoven activities that breathe life into this place. Fishermen cast their nets into the shimmering waters, while nearby, small industries hum with the rhythm of fish being processed. Tourists, drawn by the beauty and culture of the lagoon, wander the shores, adding another layer to this complex tapestry. In Barakul, Chilika is not just a lake; it's the pulse that sustains them, a resource so deeply rooted in the community's identity that it feels inseparable from their existence.

But beneath this vibrant connection, subtle shifts are beginning to show. Resources thin, and there are murmurs of detachment, whispers of a future where access to the lake and its bounty may no longer be as shared as it once was.

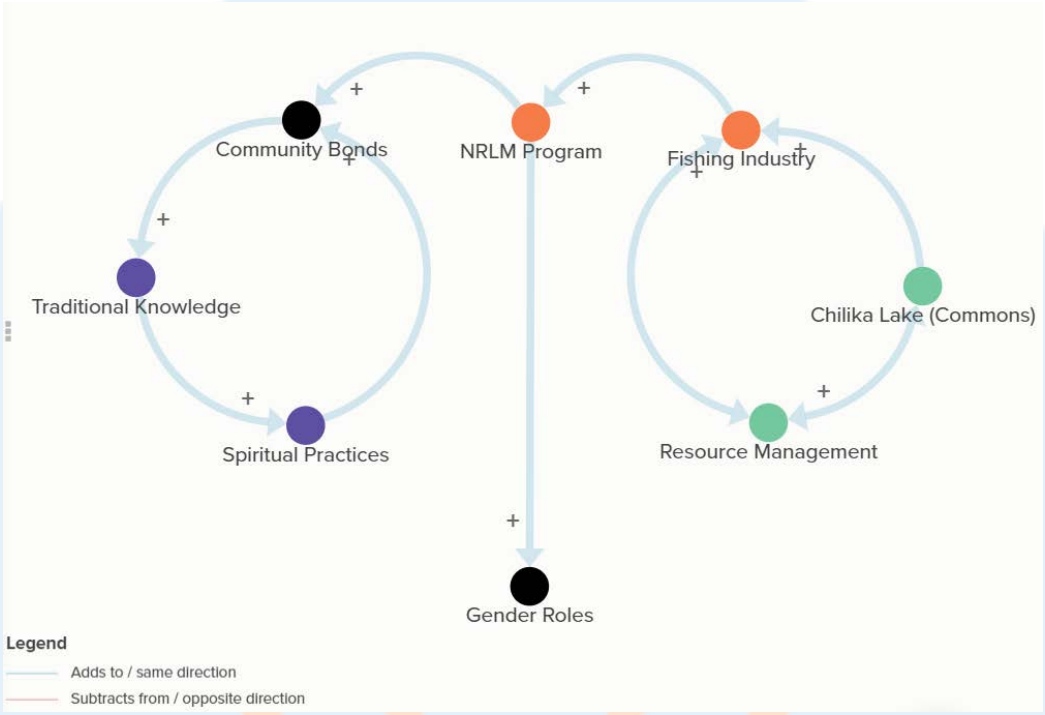
As the village carries on, a question hangs in the air: What lies ahead for Barakul? Will the threads that tie the community to Chilika unravel, or can they adapt to the shifting tides? The answers are elusive, but the signs of vulnerability are there, quietly marking the crossroads between tradition and transition.

Barakul is a small fishing village, nestled along the western shores of Chilika Lake (See *Figure 1*). Historically, the Barakul community has identified themselves as fisherfolk and this forms the basis of their resilience and coping mechanisms to changing dynamics regarding access to 'commons.' are the lifeblood of the community. In *Figure 4*, the core elements in the community that drive livelihood are highlighted. The primary subsystems within the village consist of the following components: (1) economic sub-system elements (including the fishing industry and NRLM program). (2) social structure (shared community

bonds, defined gender roles). A unique socio-cultural-spiritual sub-system exists in the community. This encompasses traditional knowledge and spiritual practices. Most importantly, there is a shared narrative within the environmental sub-system. The community heavily relies on Lake Chilika (a livelihood common), and resource management strategies, such as using bamboo to make fish cages and boats.

Figure 4

Visual representation of the micro-level socioecological system elements and system interactions in Barakul community



Source: Baker Matovu

3.2.1 Reflection(s) on Human Activities and their Relationship with the Natural System

In Barakul, a semblance of socioecological shifts is evident, as reported in most communities around the Chilika Lagoon. Narratives from the local citizens revealed that historically, the community identified itself as a 'fisher community', owing to the shared pride of being fisherfolk, shared histories, and social identity. With the increase in non-traditional activities in the sub-system, such as tourist boat cruises, and conservation among others, an intricate and interrelated network of linkages (positive and negative) is emerging. This might shape the community's ability to withstand challenges and maintain its long-term viability. With increasing shifts in the socioeconomic landscape, one wonders what could be learned and what the future might be in Barakul. A fundamental starting component of this system is Chilika Lake, a communal asset that sustains the village's economy, cultural traditions, and social structure. The well-being of the community is directly influenced by the health of the lake, thereby making its sustainable management a paramount concern.

Additionally, the economic structure of the community relies significantly on fishing, a tradition that has been transmitted across successive generations. Nonetheless, the difficulties presented by climate change and overfishing have exerted pressure on this system, resulting in a decrease in fish populations and

economic volatility. The implementation of the self-help group program under National Rural Livelihoods Mission (NRLM) and Mission Shakti has established a vital safety net that could provide alternate means of earning a living, although this might depend on the level of inclusiveness of the program. These emerging economic endeavours, such as mushroom cultivation and flower farming, have not only broadened the range of income streams but also empowered women. The increasing empowerment of women could be key in altering traditional gender roles and fostering more social equality.

3.2.2 Reflection(s) on the Impacts of Interactions

Critical interconnections exist between the social-ecological attributes within the Barakul sub-system, especially when envisioned within the viability lens. For instance, the preservation of traditional knowledge, such as the mastery of bamboo net making, could be critical in preserving indigenous cultural knowledge on conservation and livelihoods. Iteratively transmitted between generations, this knowledge cultivates a feeling of cohesion and uninterrupted progression. Social cohesion in Barakul is further enhanced by its spiritual practices. Most often communal worship places function as gathering places, and this strengthens a collective moral code and local identity.

Figure 5

Women and children of Barakul, a small fishing village on the western shore of Chilika Lake, engage in daily life, where traditional fishing practices have sustained their community for generations

Source: Laura Wilson

The environmental system, coiled around Chilika Lake, is emblematic of the collective community-government/institutional efforts for the management of commons. Although some institutional practices might limit citizens' access to critical livelihood resources, such as fish, through collaborative co-management, guarantees for long-term viability could be born. The lake's classification as a commons cultivates a feeling of shared responsibility among the people. Citizens around Barakul acknowledge that the health of the lake is directly linked to their survival.

This implies that in interconnected micro-level systems, changes in one subsystem can have ripple effects throughout the entire social-ecological system of Chilika. For example, a decline in fish populations (environmental system) can lead to economic hardship (economic system), which in turn may strain social bonds (social system). Conversely, the success of the NRLM program (economic system) can enhance social cohesion (social system) by empowering women and promoting gender equality. The crisp understanding of the interconnections within the community could spur resilience that is rooted in the ability to adapt and innovate while maintaining crucial cultural and environmental heritage.

3.3 Sub-system 3: Kalijai cultural temple/site

On the island, sacred, Kalijai stands,
Where boats converge, from many hands.
A place of worship, yes—but more,
A commons shared from shore to shore.

Each year they gather, prayers and songs,
A wheel of boats where all belong.
With rituals that bind the land,
In unity, they make their stand.

This temple holds their shared past tight,
A beacon in the soft moonlight.
Not just in stone or prayerful cries,
But in the trust where stewardship lies.

For here, the bonds of place are spun,
A sacred space for everyone.
Where birds find refuge, nature thrives,
And through this, too, the spirit survives.

Kalijai's waters teem with life,
A balance cut through toil and strife.
It offers more than what it seems,
A sanctuary woven through shared dreams.

The temple's song, the forest's breath,
Together stave off nature's death.
In every wave, in every tree,
It's more than just a place to be.

It's the heart, the soul, the guiding thread,
Where spirit, land, and life are fed.

Kalijai Temple, perched on a culturally and spiritually revered island within Chilika Lagoon (See Figure 6), is far more than a place of worship, it is a living commons that unites generations. For centuries, this sacred space has served as a focal point of spiritual connection, cultural heritage, and community identity. Every year, during the Makar Sankranti festival, citizens from across the region gather at Kalijai, their boats converging like spokes on a wheel, to celebrate shared traditions and reinforce the bonds of unity. Beyond its religious significance, Kalijai Temple fosters collective stewardship, trust, and social cohesion, transforming it into a cornerstone of both cultural and ecological sustainability. The temple and its surrounding environment also serve as a vital sanctuary for bird species and aquatic life. This highlights

the delicate balance between human activities and natural systems. Kalijai stands as a testament to the power of shared spaces, where the spiritual, cultural, and environmental converge to nourish both society and the ecosystem.

Figure 6

Kalijai Temple: A serene cultural gem nestled on an island in Chilika Lake, where devotion meets nature's beauty, preserving the rich heritage of Odisha

Source: Zina Jacobs

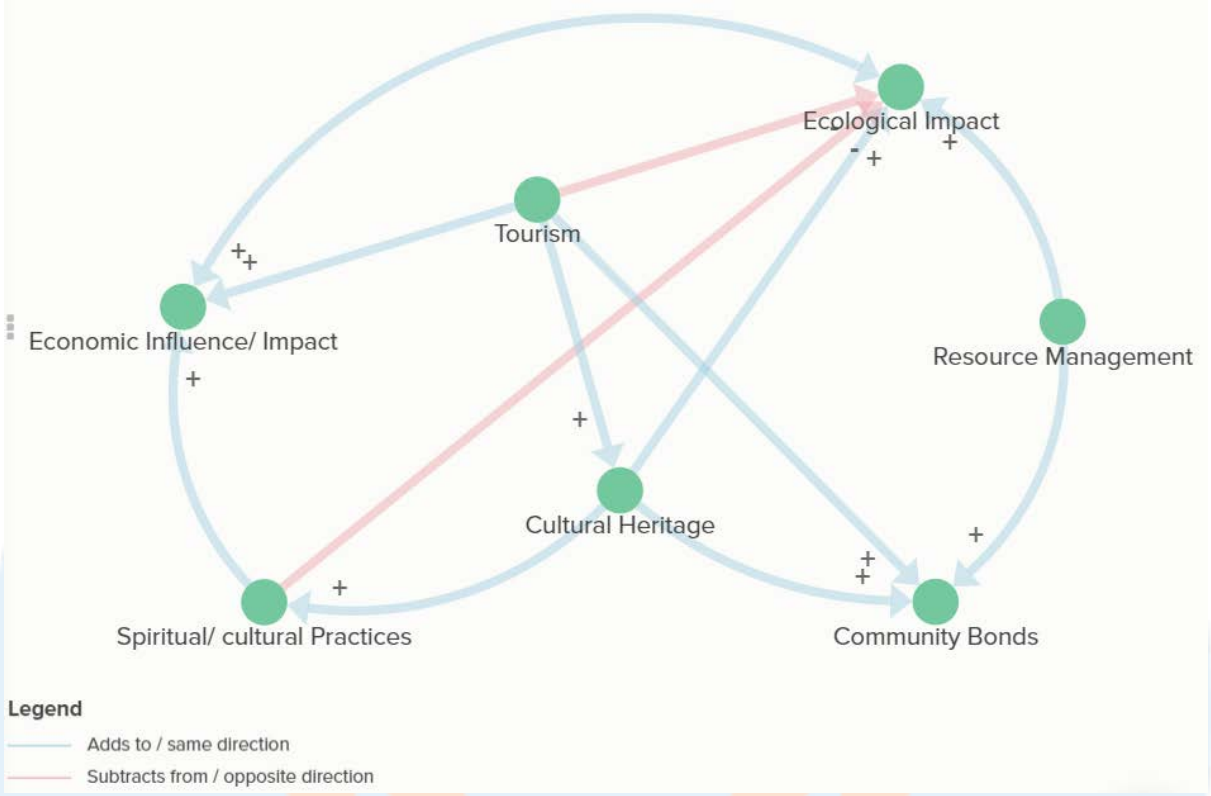
3.3.1 Reflection(s) on Human Activities and their Relationship with the Natural System

In *Figure 7*, it is highlighted that positive interactions/networks within the micro-level system of Kalijai exist. The Kalijai Temple is more than a religious site; it is a beacon of collective identity. These gatherings are filled with prayers, rituals, and the shared joy of tradition, reinforcing the bonds that tie the community together. The temple serves as a reminder of their shared history and faith, grounding them in a collective sense of place and belonging.

This sense of place extends beyond the physical structure of the temple. The trust and unity required to maintain the temple reflect the deeper, intangible benefits it brings to the community. Here, micro-level citizens manage the temple's upkeep, organize festivals, and share the responsibility of preserving this sacred site. This collective stewardship strengthens the social fabric, creating a deep sense of trust among the community members.

Figure 7

The micro-level system interactions, and networks in the Kalijai sub-system of Chilika Lagoon



Source: Baker Matovu

3.3.2 Reflection(s) on the Impacts of Interactions

In a world, where individual pursuits often overshadow communal values, the Kalijai Temple remains a testament to the power of shared spaces. It is a living example of a commons—a place where spiritual connection, cultural heritage, and communal identity converge. The temple fosters unity and faith, reinforcing the idea that some things are best held in common, cherished not for individual gain but for the collective good.

In the Kalijai Temple, the people of Chilika Lake find more than just a place to worship. Citizens find the heart of their community, a sanctuary that nourishes both spirit and society. If the community attaches value to a given common (irrespective of the size and beauty), viable and sustainable environmental governance practices can be reinforced. This is evidenced by the multiplier ecological benefits that Kalijai temple and island have served. Kalijai temple is also ecologically significant, serving as a sanctuary for various bird species, which aids in conservation efforts and draws tourists. The surrounding waters are teeming with aquatic life, contributing to the biodiversity of Chilika Lagoon, supporting local fishing, and enhancing tourism appeal. The temple's natural surroundings, including forests and water bodies, play a crucial role in sustaining the region's ecological balance while also attracting tourists. This makes Kalijai temple vital for both conservation and local livelihoods.

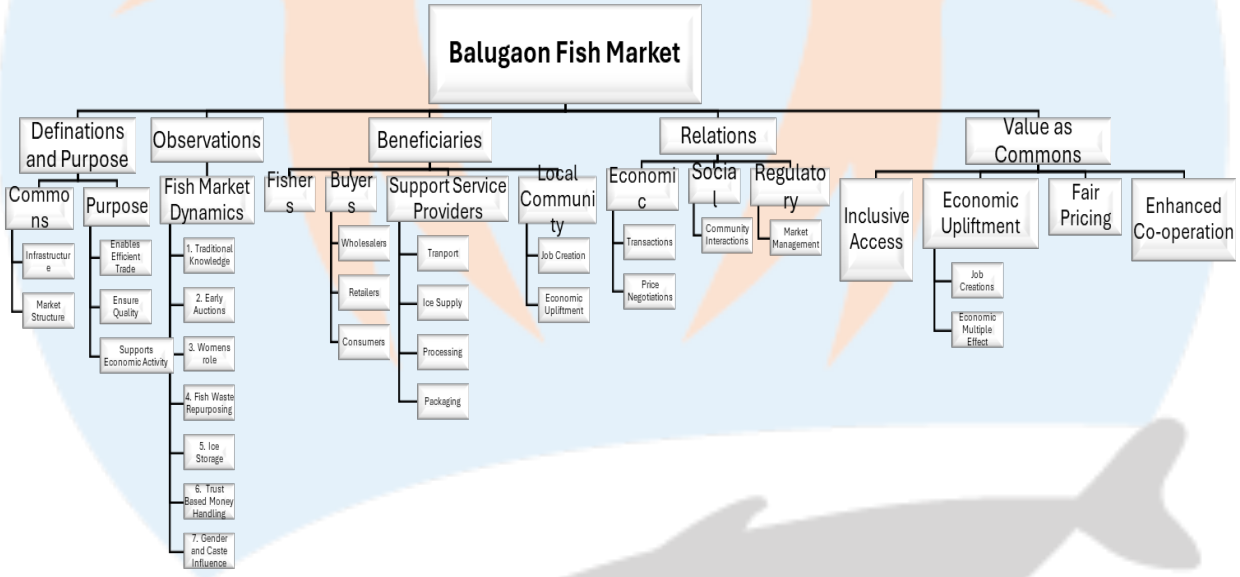
3.4 Sub-system 4: Balugaon central fish market

> *Balugaon hums with activity as fisherfolk, some with calloused hands, others newer to the trade, unload their catch—prawns, crabs, finfish—hoping for good prices to carry them through the season. Dealers circle, eyes sharp, calculating the day's profits.*
>
> *Balugaon is the pulse of a fragile connection between the people and the lake that sustains their livelihoods. Yet, cracks show—crumbling roads, strained resources, and whispers of overfishing. Amidst the flurry, a quiet tension lingers, like the pause between breaths—how much longer can this fragile dance endure before the scales shift, and the balance slips away?*

Balugaon Central Fish Market serves as a significant hub for the fish trade, directly impacting the livelihoods of fishers from the nearby Chilika Lake (See *Figure 1*). As a hub of economic activities, networks (socio-ecological), and community interactions, the market critically serves as a shared space. This is irrespective of the complexity of who owns or runs the market, who buys and sells fish or fish-related products, and who owns/benefits from the market. *Figure 8* indicates the key shared resources, and commons around the Chilika Lagoon.

Figure 8

Relations/networks/links within the Balugaon fish market sub-system



Source: Baker Matovu

3.4.1 Reflection(s) on Human Activities and their Relationship with the Natural System

The main connection between the market and the Chilika Lagoon is that most of the fish landings from Chilika are destined for the market, albeit with variations, depending on the season. Most fisherfolk around the area trade or target the dealers in Balugaon due to the ease of sale of fish and the ability to secure socio-economic livelihood safeguards, such as business loans. The main concern is that Balugaon, being the nodal fish trading point, has led to externalities, such as the depreciation of market infrastructure, including the roads leading to the market. The proliferation of affluent fish dealers and fish exporting companies might

be a precursor for unsustainability practices, especially if collaborative approaches and sustainable fish value chain principles are not developed.

3.4.2 Reflection(s) on the Impacts of Interactions

Based on the participatory observations within the market, several insights concerning the vulnerability and viability of communities and commons were uncovered. For instance, in terms of the existing market infrastructure, the Balugaon Central Fish Market serves as a vital trading hub for the Chilika Lake region. However, the market infrastructure is relatively basic and in need of significant modernization. Existing facilities, including cold storage, hygienic handling areas, and transportation services, are inadequate or outdated, leading to inefficiencies.

Figure 9

Variety of fish on display at the Balugaon Central Fish Market, a vital hub for the regional fish trade, supporting the livelihoods of fishers from nearby Chilika Lake

Source: Reashan Ujjaman

Within the same market, opportunities for improvement could also be harnessed. For instance, (i) modernization (upgrading facilities can reduce post-harvest losses, enhance the efficiency of market operations, and ensure better prices for fishers), (ii) buyers' attraction (improved infrastructure can draw more buyers, increasing demand for fish and raising incomes for local fishers, (iii) sustainability (enhanced infrastructure can contribute to the sustainable management of resources by supporting better handling and storage practices).

Within the fisheries resources and biodiversity sub-system elements, a critical observation is that the market is heavily dependent on the Chilika, as a resource pool for fish, prawns, crabs, and other aquatic products. The resources from the Chilika critically support local livelihood. However, overfishing (due to increased demand for fish) is threatening the natural ecological system balance. This is further worsened by habitat degradation due to pollution. Amidst these increasing socio-ecological pressures, vulnerability concerns on the commons are increasing, and this might create bleak futures.

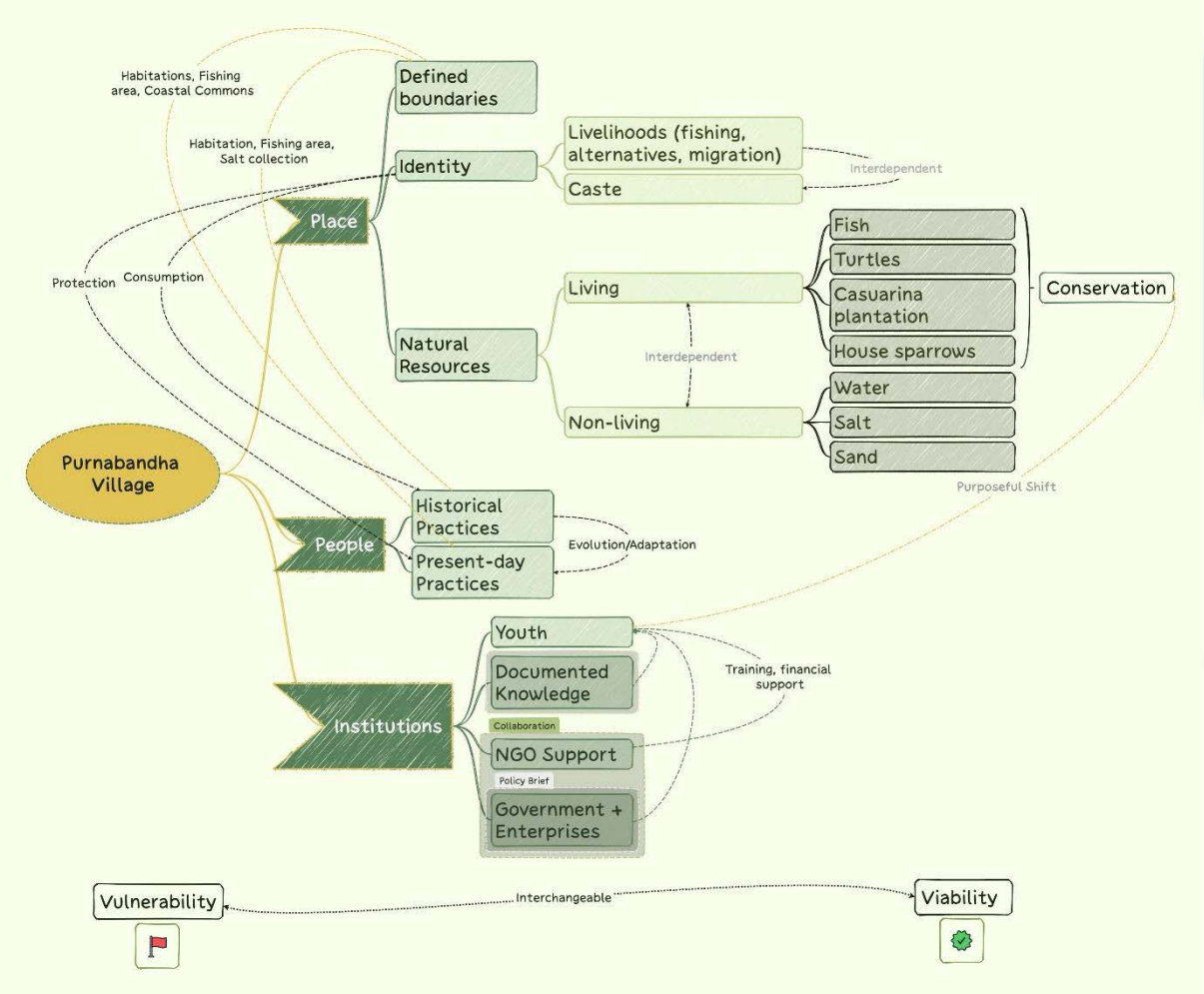
3.5 Sub-system 5: Rushikulya Olive Ridley Turtle Conservation site

Waves crash upon shore.
Migrants return from afar.
Birthplace for many.

The site is a unique sub-system of the Chilika lagoon, located in Purnabandha village, near the Rushikulya river (See *Figure 1*). The uniqueness of this area hinges on the annual mass exodus and nesting of the Olive ridley sea turtles. The sea turtles are critical reinforcing elements in the local system as they normally sail from as far as Australia. The uniqueness of this has led to a positive shift in social/community practices geared towards sustainability and conservation of the nesting sites. This is a balancing system dynamic as the community no longer poaches or collects the turtle eggs. This has been partly due to collaborative stakeholder actions, such as on sea turtle protection. *Figure 10* highlights the critical micro-level system interactions in the conservation site.

Figure 10

Networks and interactions among different stakeholders and institutions around the Rushikulya conservation site



Source: Baker Matovu

3.5.1 Reflection(s) on Human Activities and their Relationship with the Natural System

The narrative in *Figure 10* weaves together themes of conservation, community resilience, and the consequences of environmental change. A notable revelation from the community is that avenues that balance/support the creation of viable solutions can be shaped local-community level action, especially when citizens see value in it. For instance, although the government promulgated the Wildlife Protection Act to protect turtles among others, a lack of local community ownership/co-ideation in this did not deter turtle poaching. Through community stakeholders' training, awareness, leadership, and initiatives, such as the Rushikulya Sea Turtle Protection Committee (RSTPC), local communities are becoming stewards for driving sustainability transitions, ideas, and initiatives.

In vulnerable local settings, situational and participatory engagements can help in identifying and mapping local resources. This can be done by using traditional knowledge, establishing rules for better resource management, and protecting the area from commercial encroachment. For instance, when shoreline changes led to shifts in sea mounds (the turtles' nesting sites), the villagers planted Casuarina trees to prevent erosion and provide a new income source. Meanwhile, a government project aimed at improving water quality inadvertently ended salt mining, forcing some villagers to migrate in search of new livelihoods. Despite these challenges, the village of Purnabandha exemplified resilience and adaptation, turning conservation efforts and sustainable practices into opportunities that ensured the long-term well-being of both the community and the environment.

Figure 11

The entrance of the Rushikulya Olive Ridley Turtle Conservation site, a vital sanctuary protecting one of the world's most remarkable turtle nesting grounds in Odisha, India

Source: Pallabi Chakraborty

3.5.2 Reflection(s) on the Impacts of Interactions

Within the micro-level setting, several dynamics regarding place, institutions, people, and natural resources were identified. For instance:

The place is critical for understanding or driving avenues toward resilience and viability. This is because it provides the identity of the people, along with consisting of natural resources for their survival. With time, community citizens have the power to drive viable solutions that shift from unsustainable community practices. This is partly due to the increased awareness and empowerment component as well as a change in attitude, perceptions, and behaviour. Additionally, citizens demonstrated that transformative shifts in practices can evolve into present-day conservation efforts, showing a purposeful shift in attitude and behaviour. This can be reinforced by collaborative engagements with civil and volunteer groups, such as non-government organizations (NGOs).

Identity is dependent on the livelihoods and caste of the villagers which are in turn interdependent. The livelihood options are closely linked to the availability and management of natural resources. As *Figure 10* indicates, changes in natural resources due to conservation efforts or external factors (e.g., changes in water and salt resources) have influenced the community's livelihood strategies. The shift from poaching to conservation and the planting of Casuarina trees for erosion control and income generation are examples of adaptive strategies.

The interdependence between living resources (fish, turtles, Casuarina plantations, house sparrows) and non-living resources (water, salt, sand) is critical. These resources are crucial for the village's livelihoods, which include fishing, alternative activities, and migration. The conservation efforts, particularly for turtles and house sparrows, demonstrate how the community has adapted its practices to protect these resources.

4. Interpretation of and general reflection on the existing system dynamics around Chilika Lagoon in the context of commons

Through community engagements and field observations, a typology of complex issues, and interconnections emerged. First, within a given socio-ecological system, a dominant common (irrespective of the nature or type) determines the social fabric of a given individual, group, or community. This is to say that the settled population has adapted to its environment and likely understands the importance of what the dominant commons provides. Second, each micro-level component (tangible and intangible) has meaning to a given community. This should be used in trying to understand socioecological systems functioning. Lastly, socioecological systems operate as nested systems. In other words, a shock or shift in one micro-common is likely to affect the functioning of the other (positively and negatively), and with it the attached communities. A narrative related to this was reported in the Balugaon market and Barakul, where most stakeholders rely on fish catch (volumes) for the functioning of their businesses and livelihood survival. These perspectives have been well-documented in the literature on vulnerability, and complex natural resource zones (Perry et al., 2024; Grimm et al., 2024).

Cognizant of this complexity, critical questions emerge: how then can we operationalize the mapping of dominant and micro-commons' interactions to address the increasing vulnerability of the various commons themselves and the populations that depend upon them? How can findings from these explorations ensure the uptake and empowerment of citizen-led co-management systems where top-down structures have been enforced (to the detriment of the historical communal access and use of the Chilika lagoon)? We argue that this could be achieved through the amalgamation and borrowing of feasible place-based enablers and inhibitors that either reduce/increase structural (in)justice and aid just transitions to viability, resilience, and

co-governance. Most often, some system inhibitors in the short run might turn out to be enablers in the long run, as reported in the conservation shift around the Rushikulya site. This perspective has been explored in prior literature on the relationships and networks of intra-enablers in coastal communities, though with a limited focus on micro-level contexts (Dias et al., 2023; Wells et al., 2020; Nayak, 2017).

This is partly because, around the Chilika Lagoon, there seems to be covert and overt interconnectedness of the economic, social, cultural, and environmental systems, as earlier reported in studies (see: Bharti et al., 2024; Pradhan et al., 2023; Nayak, 2017). This highlights the urgency of holistic, sustainable approaches to community development, and leveraging micro-level perspectives. These could be used as a means for supporting better and viable livelihood transitions, preserving traditional knowledge, and managing natural resources collectively to ensure a thriving and sustainable future for all (Dias et al., 2023). As Chilika Lagoon is a complex, and diverse socio-ecological system, a critical building block could be the situational understanding of critical system drivers (including enablers-herein indicating actions or activities making the Chilika Lagoon a common/collectively shared resource and inhibitors-actions, stakeholders, activities, or threats that might increase vulnerability and excludability, now and in the future). *Table 1* gives a summary of the main system inhibitors and enablers.

Table 1: Predominant enablers of viability and inhibitors (increased risk to vulnerability) on the commons

Existing enablers	Existing or possible inhibitors
-Shared need for sustainable coastal livelihood practices	-Top-down conservation management practices
-Shared pride for the Chilika Lagoon	-Shifting livelihood identities
-Shared histories, visions, and beliefs	-Delayed implementation of community-resilience initiatives
-Shared identify, values, and nested village systems/interactions	-Increased demand and competition for resources in Lake Chilika
-Shared flows of knowledge and information	-Monetization of economic activities around Lake Chilika
-Shared fear and socio-ecological grief about the increasing vulnerabilities in Chilika Lagoon	-Increased coastal pressures, e.g., deforestation, coastal construction/urbanization
-Shared local institutions (at the village level)	-Zoning of Chilika Lagoon space to private stakeholders and government institutions
-Common place-based assets for livelihood welfare and resilience	-Migration and changing demographic patterns and interests
-Increased women-led initiatives and livelihood safeguards	-Loss of Indigenous and key local actors' knowledge (mortality)
-Increasing institutional-level recognition of community-led conservation efforts	-Changing socioeconomic perspectives on management vis-à-vis livelihood survival
-Increased vigilance on entry of external stakeholders/users of Chilika resources	-Changing environmental patterns
-Shared qualitative thoughts and ideas on driving resilience & reducing vulnerabilities	-Difficulties in contextualizing and quantifying resilience

Source: *Authors' creation based on the field narratives, reflections, and field observations*

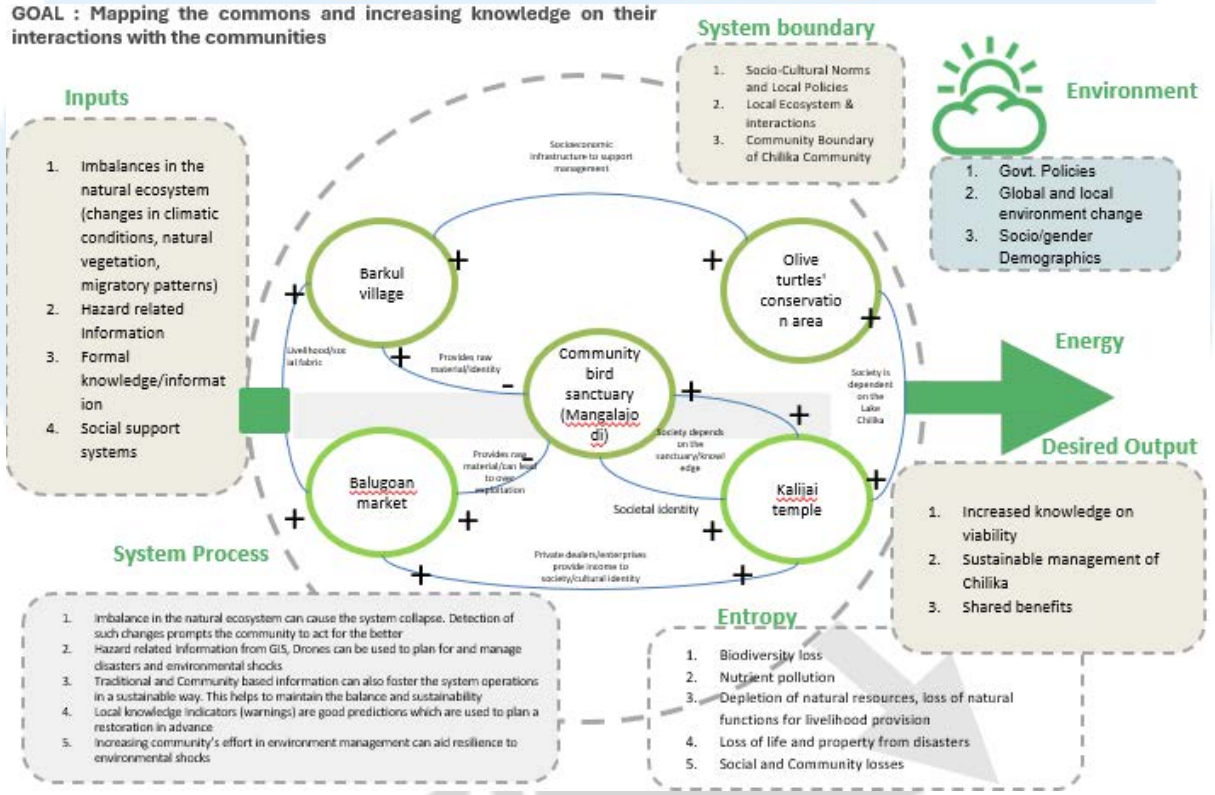
From *Table 1*, key socio-ecological perspectives in the domain of environmental resource governance and complexity are highlighted. On the one hand, citizens are cognizant of the intrinsic value of a shared common with references to 'Mother Chilika' often arising. On the other hand, however, the perpetuation

and entry of new dynamics and actors in the Chilika lagoon system threaten the historical hegemony, and social cohesion in resource management has emerged. The delayed creation of viable options for livelihood survival might lead to further encroachment, pressures, resource capture, and contestations among system participants (Matovu et al., 2024a; Pradhan et al., 2023).

The usage of 'Mother Chilika', heard around the lagoon, evidently signals a shared relation among the populations of Chilika. The fundamental question of how this opportunity can be leveraged then arises. By integrating this narrative into a systems thinking approach, threats, opportunities, stocks, flows, and relations among all components of Chilika may be better understood and applied to building future resilience. When situated in the context of Chilika, such a narrative can help identify the dominant and micro-commons, enabling conditions (direct and indirect), and inhibitors (historical and emerging, external and internal). *Figure 12* highlights the visualized novel pathway developed in this analysis to understand this.

Figure 12

Abstract system map showing the interactions and networks within the Lake Chilika general system



Source: Authors' creation based on the narratives obtained from citizens in the five communities

In *Figure 12*, an effort to connect the critical and dominant commons in the five communities we interacted with around the Chilika Lagoon is made. This is supplemented by the charting of the inputs in the system, system process, and entropy that might positively or negatively impact livelihood viability and resilience. The viability of this pathway is well-supported by the myriads of indicators of vulnerability and viability as observed during the interactions with the communities around Chilika. For instance, a shared concern among populations who depend upon the Chilika Commons is the increasing inequitable over-extraction of

natural resources that is perceived to be increasing vulnerability among such populations and the commons itself. This relationship implies that irrespective of the nature and extent of external pressures on the system, the ramifications might be dire. This vulnerability perspective, mostly for fisherfolk around the Chilika lagoon has been succinctly elaborated in previous literature (Pradhan et al., 2023; 2022; Nayak et al., 2017). In the context of charting sustainable transformations, the viability of adaptation and mitigation strategies might depend on how collaborative and supportive they are to enhance trust-building among local citizens. This could partly be a result of the hidden concerns and issues that some citizens in some areas around Chilika have concerning institutionalized-led conservation measures or regulations towards shared access to the Lagoon.

5. Conclusions

Stories obtained from the citizens sedentary around the Chilika Lagoon represent an emerging complexity that can only be critically understood by exploring the tangible and intangible narratives of change in vulnerable contexts. Narratives and observations partly revealed that mapping commons is extremely complex. Around Chilika Lagoon, this complexity is heightened by the decades-spanning shift in the socioeconomic and environmental fabric of the local livelihood activities and demographics.

Recently, the proliferation of business-minded activities, and the entry of externally motivated practices for the use and management of the Chilika Lagoon, have popped up divergent views regarding Chilika as common. On the one hand, key stakeholders argue that conservation practices led by the government are a necessity as they help in creating sustainable legislation, monitoring, and enforcement mechanisms on unsustainable resource use practices. Unfortunately, this narrative is viewed differently by the affected communities whose livelihoods have been shaped around the Chilika, such as in Barakul. To this end, critical social capital and trust are regressing. Additionally, in communities where livelihood safeguards are being charted, such as Mangalajodi, socioeconomic challenges emanating from livelihood transitions have been perpetuated.

These hidden and observable complexities might not be sustainable in the comprehensive domain of environmental governance, and socioecological systems resilience to vulnerability. What is clearer is that Chilika Lagoon is no longer the same, and there seems to be an increasing appetite for more coastal developments and economically motivated projects. Urgent collaborative engagements and initiatives might be the key to balancing the emerging unsustainable shifts and livelihood grief. What is less clear is how to prioritize citizens' livelihoods, balance environmental vulnerabilities, and co-create sustainable and viable actions that sustain multi-scalar commons. The starting point can be a focus on interdisciplinary and transdisciplinary research that holistically uncovers the situational indicators of complexity, the drivers, their impact, and local narratives for building transformation. Such research perspectives can bring forth critical citizens' knowledge of socio-ecological systems, aid in micro-level stakeholders' power dynamics mapping and interaction, and community-level co-governance and conservation planning.

For such research to be impactful, a paucity of methods could be leveraged, such as empirical and ethnographic methods, and these can examine diverse dynamic but relatable drivers of vulnerability/viability across the riparian communities of the Chilika Lagoon. In the social science domain, intrinsic cultural assets that define sustainable governance and natural resource use around the Chilika Lagoon could be explored. This can help in the identification of feasible and agreeable collaborative conservation governance types or actions in each zone/setting/community around the Chilika lagoon. Similarly, because the determinants of resilience may vary depending on climatic, physiographic, biological, cultural, political, and institutional factors, empirical investigations could be carried out in a variety of geographic contexts. Research results could be enhanced by methodically including the social dimensions of diversity, connectedness, and resilience in conservation planning, which has frequently concentrated only or mostly on the biophysical characteristics of the several ecosystems of the Chilika

lagoon. Additionally, as voluntary commitments to preserve shared resources are emerging, avenues for building socioecological safeguards, such as voluntary community-led management are increasing. This can help build transformative actions for driving sustainable cultures and actions at micro-level and regional-level scales.

5.1 Addendum – 'Mother (Maa) Chilika'

During our visit in 2024 to Chilika Lagoon for the V2V Annual Field School, we spent many hours discussing, listening, reflecting, and storytelling among our fellow researchers and the communities that had granted us access to their beloved spaces. Through these periods of sharing, the term and concept 'Mother Chilika' (Maa Chilika) cropped up time and again, sitting deeper with us at each mention. Dr Prateep Nayak explained that the title had been endowed by the local fishers and was commonly used when discussing and addressing the environment and ecosystem that compose the lagoon region. It was a title of love and respect for the waters and shores. A representation of dependence upon her and what she provides. Personifying that to which can give or take life and purpose. These people understood that this place was more than its parts, drawing it more akin to a caretaker and provider than to a composition of resources from which they could extract.

Figure 13

A serene view of the Chilika Lagoon, where nature and culture intertwine in harmony, revered locally as Mother (Maa) Chilika' by the fishing communities that depend on her waters

Source: Laura Wilson

The use of 'Mother' is not a meaningless entitlement that should merely draw a cutesy reaction from those who hear it. She is a nurturer, charged with caring for her young, but she also holds power and may reprimand those who step out of line. She may bring blue skies or harsh winds, full nets or empty cages, prosperity, or punishment for those in her stead. She deserves respect for what she may or may not provide, and she knows it. The traditional communities that have come to be integrated with the lagoon clearly understand their relationship with the ecosystem as they observe practices that sustain their provider.

However, the conflict has arisen as human systems have grown and shifted to favour practices of extraction and transaction.

“Mother Chilika is crying”; is a proverb that carries weight to our ears. It is hard to stomach the thought of a weeping mother. Traditional communities of Chilika recognize the damage that is being caused by this transition to extraction. Fingers are pointed, but whether blame may be passed onto newcomers or adapting locals, pressures have increased upon the waters and their provisions. As demand for fish catch has increased, as pollution has increased, as the number of boats and shoreline developments have increased, the reliance, the dependence, the demand, and the pressure on Chilika has increased but the attention has moved on to other things. Mother is growing tired as our gaze is directed elsewhere. She is trying to love and nurture but the action is not reciprocated. A rupture in relations has surfaced as human systems have turned inward, becoming self-serving with little thought accorded to the ground on which they stand. Who is caring for the mother? How can something sustain us if we do not sustain it?

Casualties of this metabolic fault are more than just us. How we think and act is deeply connected to the environment in which we think and act. Mother Chilika is mother to more than just the humans that suckle selfishly but to the fish and birds, the reeds and seagrass, the turtles and crabs, the sand and rocks, and everything present in this place. Sustaining mother is vital for more than just our survival, but for our siblings who also watch her cry. It is not the rock’s doing, but culpability does not matter here. We have the power to harm and to heal just as Mother Chilika does. If Chilika is to continue to provide, she must also be loved.

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The Vulnerability to Viability (V2V) project is a transdisciplinary global partnership and knowledge network. Our aim is to support the transition of small-scale fisheries (SSF) from vulnerability to viability in Africa and Asia. Vulnerability is understood as a function of exposure, sensitivity and the capacity to respond to diverse drivers of change. We use the term viability not just in an its economic sense but also to include its social, political, and ecological dimensions.

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