



VULNERABILITY TO VIABILITY
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Reflections from Chilika-V2V Field School: Exploring Local Ecologies and Social- Ecological Dynamics

V2V Working Paper No. 2024-03

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May 2024



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How to cite:

Nair, N., Teerthala, M., Ghosh, P., Attipoe, E., Norberg, E., Djatayu, M., Rahman, E. (2024). *Reflections from Chilika - V2V Field School: Exploring Local Ecologies and Social-Ecological Dynamics*. V2V Working Paper 2024-03. V2V Global Partnership, University of Waterloo, Canada.

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V2V Global Partnership is supported by the Social Sciences and Humanities Research Council of Canada under its Partnership Grant Program.



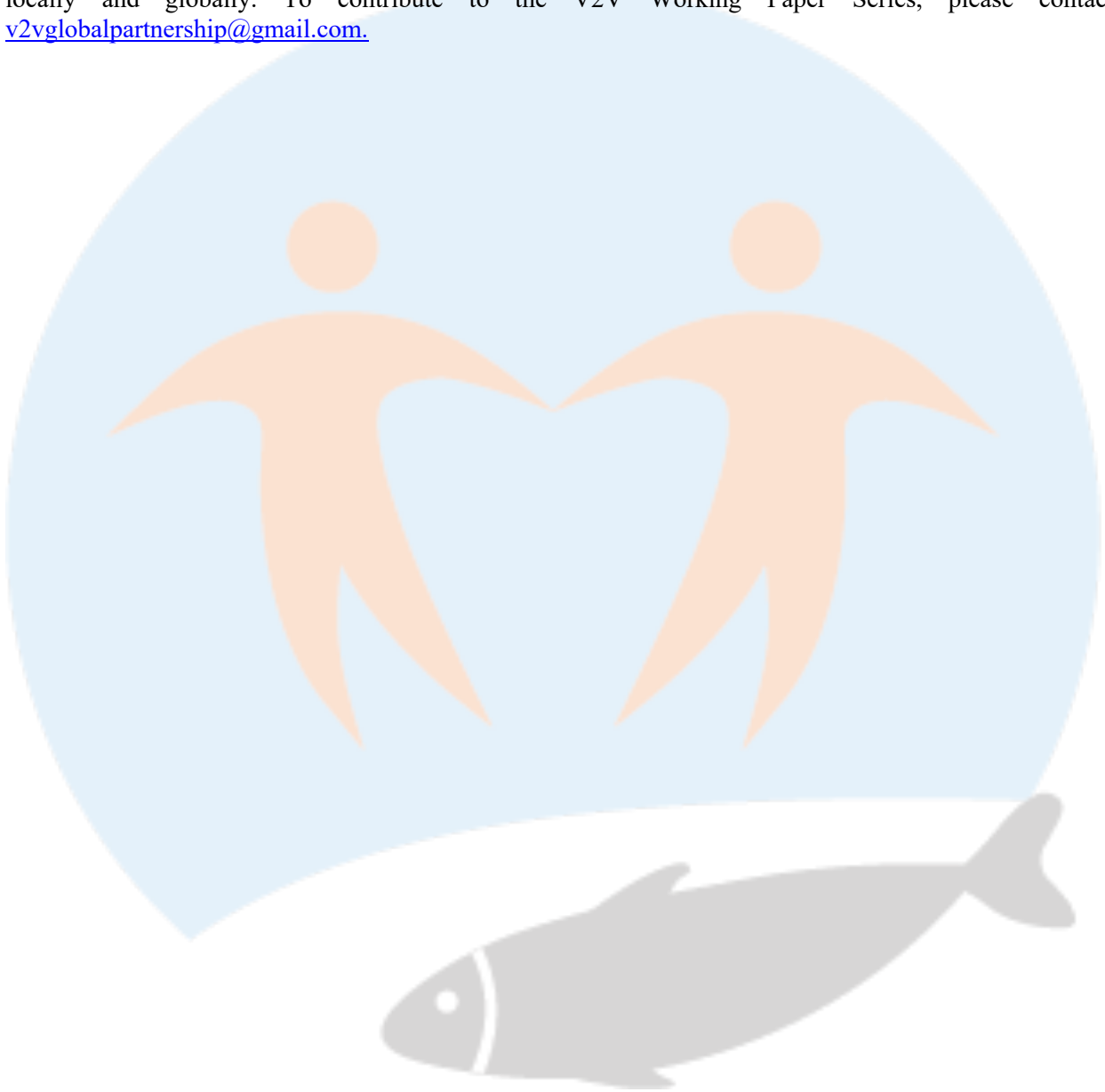
Social Sciences and Humanities
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V2V Working Paper Series

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.

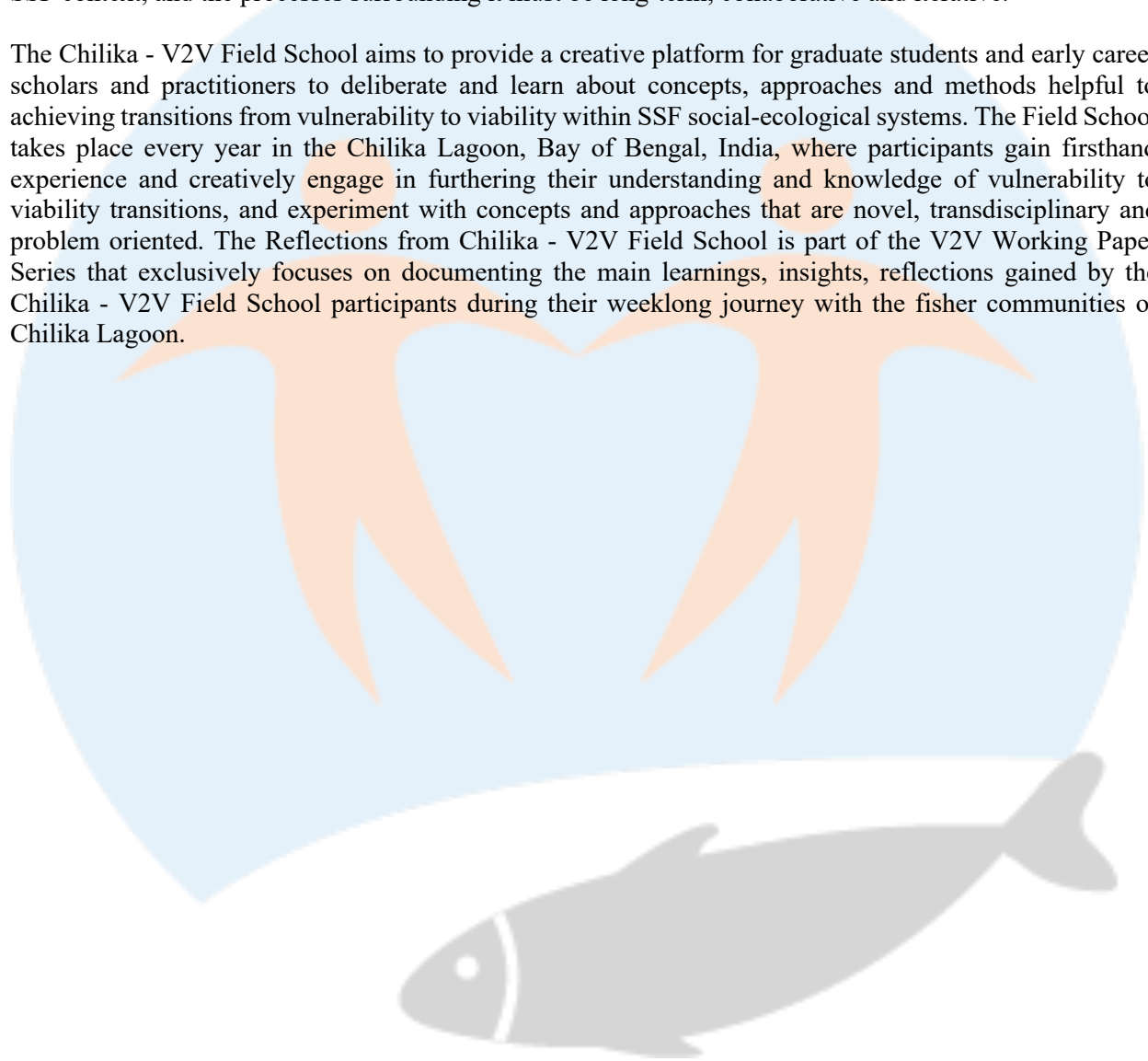


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Reflections from Chilika - V2V Field School: Exploring Local Ecologies and Social-Ecological Dynamics

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1. Introduction

Chilika Lagoon is the largest brackish water lagoon in Asia, spread over a 1000 sq. km. area across Puri, Khurda, and Ganjam districts in Odisha along the Bay of Bengal on the eastern coast of India (Figure 1). About 0.3 million fisher populations in more than 120 villages directly depend on Chilika Lagoon for their small-scale fisheries (SSFs) based livelihoods (Nayak & Berkes, 2011). The Chilika Lagoon is the largest coastal lagoon in India and is known for its rich biodiversity and socio-economic significance. Chilika stands as a crucial ecological hub, supporting a myriad of ecosystems. The concept of marine social-ecological systems (SES) has recently gained prominence (Berkes, 2011). Based on the historical view of these changes, paying particular attention to the economic history of the area as that relates to lagoon social-ecological processes. There are several components of (a) the social, e.g., political, economic, and cultural, and (b) the ecological, e.g., biophysical, geological, and hydrological, subsystems of SSFs systems that are integrally linked (Nayak, 2014).

Human actions have an impact on biophysical systems, and biophysical elements have an impact on human well-being, demonstrating the interrelated nature of the social, or human, and ecological, or biophysical, subsystems (Berkes, 2011). Addressing the social dimension of resource management, without understanding the resource and ecosystem dynamics, would not achieve sustainability and resilience in diverse system components (Folke et al., 2005). This means that both social and ecological processes define and determine the nature of changes in socio ecological systems, with social outcomes dependent on ecological dynamics and vice versa (Charles, 2007). The significance of humans in creating ecosystem processes and dynamics is recognized in social-ecological analysis (Dale et al., 2000), which values both their power to change and their sensitivity to environmental change (Waltner-Toews & Kay, 2005).

Mahon et al. (2008) view SSFs as complex systems because most of these social-environmental challenges are complicated, persistent, or repeating, and are often difficult to identify or permanently resolve because to their greater ecological, social, economic, and political repercussions. Chilika Lagoon is home to a wide range of aquatic wildlife, including several fish, shrimp, and crab species. Most local fishing populations rely on this species diversity for food and money. The fishers are generally aware of the norms and rules in place, and we learned that they took precautions to avoid harming the dolphins, such as returning dolphins caught while fishing alive to the water. Over the previous ten years, there has also been a considerable reduction in fish catch. This is due in part to changes in the lagoon's habitat characteristics, which are linked

to a number of factors, including poorly managed aquaculture activities, increased siltation as a result of the opening of an artificial sea mouth and deforestation in the catchment area, and the presence of waste, such as sewage discharge and single-use plastic disposal by tourists. All of this has had a deleterious influence on the lagoon's biodiversity, population abundance of marine animals, and fish stocks.

Figure 1

Location map of Chilika Lagoon



A social-ecological viewpoint allows for various levels of study, multiple realities, and thus multiple approaches to solving complicated social-ecological systems (SES) problems (Nayak, 2014). The aim of our field school endeavor was to engage in firsthand experiential learning on the intricate dynamics of Chilika Lagoon's ecosystems and the associated social-ecological transformations. Our exploration delves into the intricate balance between the local ecologies of Chilika and the social-ecological changes it has undergone. This report examines the sensitive nature of this lagoon, emphasizing its ecological significance and the intricate web of socio-cultural aspects intertwined within its waters. The field work aimed to understand the interplay between natural systems, human activities, and environmental changes in the lagoon's ecosystem.

2. Methodology

V2V Global Partnership is designed to bring together a diverse group of researchers and practitioners to produce a landmark regional comprehensive understanding upon the socio-economic and ecological life trajectories of the SSFs in the Chilika Lagoon. The Krushna Chandra Jena Chilika Field School hosted by Vulnerability To Viability (V2V) Global Partnership, University of Waterloo, Canada; in collaboration with the Rekhi Centre of Excellence for the Science of Happiness, Indian Institute of Technology Kharagpur and NIRMAN Odisha; under the larger theme of ‘Environmental Change and Governance, Blue Justice and Coastal Livelihoods to Transition from Vulnerability to Viability’; highlights a ‘day-in-the life’, and ‘behind the scenes’ in demonstrating the socio-ecological empirics dotting the SSFs of Chilika – the largest brackish water lagoon, sprawling Puri, Khurda, and Ganjam districts of Odisha in eastern India. The coverage pertains to field realities captured in Barkul (Khurda) during the month of August 2023. As participants of the field school, we navigated through the repository of existing literature, to become familiar with heterogeneous findings from the case study sites, to incorporate the final details into our core area of analysis. By the means of field surveys, conducting discussions, and by organizing multi-stakeholder workshops to cultivate a synergistic space for interactions among different groups related, in a variety of ways, within the SSFs networks. Besides, the interdisciplinary team composition with expertise of environmental history, political ecology, human rights, cultural studies, and physical geography, enabling one another to capture the nuances in economic, institutional, and environmental flows, shaping fish production and practices at the Lagoon.

Figure 2

Discussion with community members about the vulnerabilities they face



Source: Photo was captured during the Chilika - V2V Field School 2022 by Md. Emon Rahman

We initiated the study by conducting an extensive review of existing literature related to SSFs, environmental change, governance, and coastal livelihoods in Chilika Lagoon. This helped the interdisciplinary team to become familiar with heterogeneous findings from case study sites and provided a foundation for our core area of analysis. We engaged in immersive participant observation to understand the daily lives and practices of SSFs in Barkul and nearby villages. These observations included

conversations with local community leaders, fishers, and other stakeholders, to gather in-depth insights into their perspectives and experiences. Discussions were organized to facilitate group interactions among SSFs, women fishers, community members, and other stakeholders. This method helped capture collective perspectives on social-ecological changes in the Chilika Lagoon. Our team conducted discussions with individuals possessing specialized knowledge in environmental history, political ecology, human rights, cultural studies, and physical geography. This approach aimed to capture nuanced aspects of economic, institutional, and environmental flows shaping fish production and practices.

Through these methodologies, we learned and realized about the case study specificities pertaining to practices, relationships, challenges, and conflicts; theoretically comprehending the institutional linkages, feedback mechanisms, socio-hydrological aspects, and gendered roles with regard to transdisciplinary intersections manifested through the stakeholder involvements, management participation, and social inclusion. The Field School also helped us in becoming acquainted with the Natural, Socio-Cultural and Political dynamics of the case study sites, alongside the historical backdrop and with the belief systems prevalent in the region; highlighting the uncertainties, perilous threats, and opportunities, accomplished through the comprehensive literature analysis, which in turn crafted the survey designs and questions for the discussions.

Figure 3

Village meeting with women fishers



Source: Photo was captured during the Chilika - V2V Field School 2022 by V2V Global Partnership

As participant observers, culturally and linguistically connected to the stakeholders in the field, we initiated friendly conversations with female fishers, male contractual fishers and fish labourers, the middlemen or mahajans in the market spheres controlling the business. We conducted group discussions to explore diverse perspectives on daily activities at both catch and market zones in Chilika Lagoon. These discussions focused on understanding socio-ecological risks and how people cope with them. Through interviews, we gathered firsthand accounts and insights, which were then transcribed and organized thematically to identify patterns and connections in the findings.

3. Disclaimer/Reflexivity Statement

The perspectives presented in this paper are the result of a week-long, immersive field experience; however, we recognize that this limited time frame was not sufficient to explore this topic comprehensively. The observations and recommendations made in this paper should be considered based on that context.

4. Ecological Significance of Chilika Lagoon

Chilika Lagoon, located along the eastern coast of India, stands as one of the largest brackish water lagoons globally, spanning Puri, Khurda, and Ganjam districts in the state of Odisha. This vast ecosystem, with its unique blend of marine, freshwater, and terrestrial elements, holds immense ecological significance. The complex interplay of biological diversity, hydrology, and human-environment interactions in Chilika Lagoon contributes to its status as a Ramsar Wetland and demands a thorough examination of its ecological importance. Chilika Lagoon boasts unparalleled biodiversity, supporting various habitats crucial for aquatic and avian life. Its significance spans from being a nursery for fish species to providing a sanctuary for migratory birds, highlighting its role as a cornerstone of the local ecology. The Chilika Lagoon habitat is home to approximately 225 fish species, 710 plant species, and 800 different animal species (Nayak, 2014).

Figure 4

Small-scale fishers in Chilika poised on their boat, ready to cast their nets for the day's catch



Source: Photo was captured during the Chilika - V2V Field School 2022 by Meghana Teerthala

Recognized as an estuarine-like shallow lagoon, Chilika fosters a highly productive ecosystem that provides significant livelihood opportunities [Mohapatra et. al., 2007; Nair & Nayak, 2023a). At one point, over 400,000 fishers residing in approximately 150 village units around the lagoon derived their livelihoods from its fertile fishing areas (Nayak, 2014). The thriving fisheries in Chilika play a vital role in sustaining the livelihoods of over 0.2 million fishers and contribute nearly 9% of the marine product revenue for the state of Odisha (Nair & Nayak, 2023a). It is noteworthy that approximately 86 percent of the fish species in the wetland are migratory, relying on riverine and marine habitats for specific stages of their life cycles (Finlayson, 2018). This intricate web of hydrological connections contributes significantly to the ecological richness and diversity observed in Chilika Lagoon. The intricate blend of resources within Chilika Lagoon,

encompassing water, aquatic life, vegetation, wildlife, and cultural elements, intricately influences the livelihoods of the SSF community. The presence of both freshwater and brackish water resources in Odisha significantly bolsters the resilience and productivity of the fisheries sector (Nair & Nayak, 2023b). Despite its ecological importance, Chilika Lagoon faces several threats, including habitat loss, overfishing, pollution, and climate change. The increase in anthropogenic activities poses a significant challenge to the delicate balance of this ecosystem.

5. Sensitive Ecosystem: Social-Ecological Changes

Pollution, overfishing, climate change, and habitat degradation pose significant threats. Understanding and mitigating these challenges are crucial for the lagoon's sustainability. Discussions with local citizens and fishers highlighted the introduction of mechanical boats to the lagoon, overfishing, pollution, aquaculture, bycatch, a growing population, sedimentation from deforestation, and a change in fishing equipment as the primary impacts to fish quantity in Chilika. Although all of these drivers are present and impacting the socio-ecological system, the field course supplemented by a literature review highlighted three primary drivers, the construction of the artificial sea mouth, an increase in tourism, and aquaculture.

5.1. Artificial Sea Mouth

Geological evidence indicates that during the later Pleistocene period, Chilika Lake was part of the Bay of Bengal. Over time, it transformed into a lake and later into a shallow lagoon due to factors like littoral drifts and the formation of a sandbar on the eastern side. Currently, the lagoon is linked to the sea in the vicinity of Satapada via shoals, sandbars, sand spits, shallow openings, and a narrow channel (Sarkar et al., 2012). The oral history of the Chilika lagoon suggests the importance of sea mouths and records the presence of seven sea and river mouths contributing to the distinctive characteristics of the lagoon (Nayak, 2014). Having lost most of its sea mouths by the twentieth century due to natural processes, Chilika had only one sea mouth recorded functional by the Bengal District Gazetteers in 1908 which was later found to be insufficiently functional (O'Malley 1908; Nayak 2014).

In the late '90s, fisher communities relying on Chilika for their livelihoods experienced a significant decline in lagoon fish stocks, this timeline was validated by members of a community visited during the field course who remembered fish stock last being plentiful 20-25 years ago. The decline over this period was attributed to the permanent closure and shifting of the sea mouth. The sea mouth closure, in addition to other factors such as heavy weed infestation and a severe cyclonic storm in 1999 has resulted in cumulative impact on the livelihoods of the dependent coastal communities. Due to such drastic changes in ecological systems in Chilika lake and overall biodiversity loss, the lagoon was included in the Montreux Record in 1993 (Mohanty et al., 2009). The Montreux Record is a register of wetland sites on the Ramsar Convention's List of Wetlands of International Importance that are facing particular pressures and are in need of attention. The significant impact on local ecosystems and dependent communities emphasized the need for government interventions. Formed in 1992 by the Government of Orissa, the Chilika Development Authority (CDA) was established to oversee the restoration and comprehensive development of the lagoon and serve as a coordinating body among various institutions and stakeholders (Dujovny, 2009). Subsequently, CDA implemented hydrological intervention through opening of a new sea mouth which was inaugurated on September 23, 2000, resulting in an 18 km reduction in the length of the outflow channel ("Chilika Lake Eco-Restoration," n.d.).

Earlier reports show that the new sea mouth opening had positive effects on the lagoon, including increased salinity leading to a significant reduction in aquatic macrophytes (Ghosh and Pattnaik, 2005), enhanced species diversity through auto-recruitment from the ocean and free-breeding migration (Ghosh et al., 2006), and a substantial rise in fish landing after the artificial sea-mouth opening (CDA 2008c). However, studies

indicate that the opening of the new sea mouth is viewed by several communities as an ecological and economic disaster (Dujovny, 2009). This is primarily attributed to insufficient stakeholder consultation prior to implementation. Many communities expressed support for renovating the old sea mouth instead of dredging a new one. While the new sea mouth facilitated sediment flushing, it also led to an excessive influx of seawater, causing ecological and livelihood impacts (Nayak and Berkes, 2010). Fisher communities faced various issues, including difficulties accessing fishing grounds, conflicts related to fishing territory, stronger tidal currents impeding net anchoring, and the sea mouth being wider than promised (Dujovny, 2009). Overall, communities argue that the lake's condition deteriorated, leading to a decline in fish catch (Nayak, 2014), highlighting a lack of community involvement in decision-making processes.

During a discussion with a senior official at the Department of Wildlife and Forestry it was noted that, despite claims that the new mouth was a scientific and engineering solution to Chilika's ecological instabilities, the sea mouth has now been closed and revegetated to protect against excess wind and high tides. Chilika Lagoon currently has three natural mouths that are operational and work to maintain the brackish quality of the lagoon.

5.2. Tourism

Tourism is widely acknowledged as a potent instrument for development and a crucial catalyst for socioeconomic advancement. The sector possesses the capacity to tackle a diverse array of global concerns, such as poverty, unemployment, climate change, and environmental degradation. As a multidimensional phenomenon with social, cultural, and economic dimensions, tourism was re-defined in 2008 by the United Nations World Tourism Organisation as the process of moving away from one's home country or habitual place of residence, for personal, business/professional reasons.

Figure 5

Serene view of tourist boats aligned the Barkul Motor Boat Association



Source: Photo was captured during the Chilika - V2V Field School 2022 by Meghana Teerthala

The inception of tourism in Chilika commenced in 1992, attracting a significant number of international tourists (Frayne et al. 2022). The diminishing fish harvest from the Chilika Lagoon, together with a decrease in household income, compelled fishers within the lagoon enclave to explore alternative economic avenues for their survival. Chilika fishers adopted tourism as a new method of economic sustenance in response to

diminishing fish catch and income. The Chilika Development Authority (CDA) made significant investments in the ecological restoration of the Chilika lagoon to counter the decreasing fish resources and household income. This initiative aimed to highlight the recreational potential of the Chilika lagoon (Finlayson et al. 2020). An economic survey undertaken in 2015 showed that tourism in Chilika generated a total income of US\$ 51.8 million. The amount exceeded the earnings generated by fishing by a factor of 2.3 (Finlayson et al. 2020). The rise in tourism in the area was facilitated by the growing population of Irrawaddy dolphins since they functioned as a significant draw for visitors.

The introduction of tourism as an economic advantage resulted in alterations to the social and ecological conditions of the residents of Chilika. To enhance the appeal of tourism, industry operators had to transition from conventional wooden boats to mechanized fiberglass boats (Frayne et al. 2022). The noise pollution by the mechanized boats were observed to have caused the displacement of dolphins and migratory fish species, hence exacerbating the reduction in biodiversity inside the Chilika lagoon. In addition, pollution originating from liquid sources such as oil leaks from mechanized boats, as well as solid trash generated by visitors, frequently entered the lagoon, thereby altering the quality of the aquatic environment necessary for the sustenance of aquatic life. The cumulative negative consequences of the lagoon resulted in a decrease in the ecological benefits, which in turn has an overall impact on human well-being.

5.3. Aquaculture

Aquaculture is breeding, raising, and harvesting fish, shellfish, and aquatic plants. Basically, it's farming in water. In the U.S. Aquaculture is an environmentally responsible source of food and commercial products, helps to create healthier habitats, and is used to rebuild stocks of threatened or endangered species (NOAA, 2023). Global production of fish from aquaculture has grown rapidly over the past four decades, contributing significant quantities to the world's supply of fish for human consumption. Aquaculture now accounts for almost half (45%) of the world's food fish (note that 'food fish' or simply 'fish' in this document refers to production of aquatic animals [fish, crustaceans, molluscs, echinoderms, amphibians]) (Subasinghe et al., 2009). Following aquaculture growth, in the near future, will produce more fish for direct human consumption than capture fisheries. Aquaculture, which started as primarily an Asian freshwater food production system, has now spread to all continents, encompassing all aquatic environments and using a range of aquatic species. From an activity that was principally small scale, non-commercial and family based, aquaculture now includes large-scale commercial and industrial production of high-value species that are traded at national, regional and international levels (Subasinghe et al., 2009).

While aquaculture has pronounced nutrition and economic implications, the nature, scale, practice and consideration of equity issues holds key for its effectiveness towards desired goal. Traditional fisheries in Chilika Lake have declined as a result of numerous policy actions. These included a policy employing outsiders to boost shrimp aquaculture, which increased quickly by the mid-1990s. Parts of the lake were also set aside for conservation purposes at the same time. The state rarely contacted or compensated local fishing communities when allocating regions for conservation, and the fishers were viewed as trespassers. Chilika Lake is an example of a fishery that is formally unregulated (Sekhar, 2004).

5.4. COVID-19

The fast spreading of COVID-19 and its impacts all over the world caused fear and uncertainty (Ahorsu et al., 2020). This unanticipated situation had a significant impact on the poor and low-income people in the developing nations (Shammi et al., 2020). The pandemic exacerbated existing vulnerabilities and brought new ones among the fishing community of Chilika Lagoon. The fishers struggled to earn their livelihoods because of declining fish catches. COVID-19 brought restrictions to fishing practices, facing a substantial disruption to the overall fish supply chain (Das et al., 2022). It disrupted the transportation facilities, ice processing, landing sites and overall logistics of the seafood value chain. Fishers also reported that the

restrictions brought by the pandemic impacted their livelihood, income, and food and nutritional needs of their family members, leaving fishers in extreme need of Government support. Many fishers didn't receive assistance because they lacked identification or contacts with the authorities who provided it, thus exacerbating their sufferings. The shocks and stressors associated with the pandemic had also brought domestic violence and child exploitation such as increased child labour and school drop outs, affecting the well-being of family members.

6. Socio-Cultural Aspects

6.1. Caste System

This socio-ecological system is unique in that it exists in an area where society is structured on caste system. The caste system formed the initial basis for property rights and fishing access in Chilika, which can be traced back through recorded evidence to the 1500's (Nayak 2014). This long history of certain castes being defined as fishers has transformed fishing from a mere livelihood to a social identity. Unfortunately, certain castes historically associated with fishing activities face both social and economic marginalization, affecting their access to resources and opportunities. Marginalized communities, particularly tribal groups and certain fishing communities, often face exclusion from decision-making processes and limited access to education and healthcare, despite their clear traditional knowledge, which has historically played a vital role in the ecological practices of the lagoon.

The importance of fishing to the identity of community members in the fishing caste was clear in the reactions of members of fishing communities when questioned about the topic. One woman during a visit to a fishing community noted that the changing role of women in society to working in jobs other than those that support the fishing industry was seen very negatively by the community. She emphasized that they are fishers by caste, birth, and identity, Chilika is their farmland, and that anything else is undesirable.

6.2 Marginalization and Social Identity

The decline in ecological and economic benefits from SSFs with its accompanying ramifications is often viewed in the marginalization of small-scale fisherfolks and communities. Marginalization is manifested in various forms and on varying scales. The depiction of marginalization in the context of Chilika is articulated through the lens of social exclusion. Razer et al. (2013) define social exclusion as the condition in which individuals or groups cannot actively engage in meaningful activities or get the advantages their community offers. Based on the definition presented, marginalization can be seen as a state of being with its accompanying emotions. Common emotions associated with marginalization is the feeling of not fitting in and thus perceiving oneself as unappreciated and unable to make a meaningful contribution to a group (Mowat, 2015). It also entails being unable to access the same resources and opportunities as others. Marginalized communities, particularly tribal groups and certain fishing communities, often face exclusion from decision-making processes. Despite the perceived marginalization, the traditional knowledge of the marginalized plays a vital role in the ecological practices of the ecosystem.

In Chilika, coastal fisheries have been the people's way of life, as defined by their association with various Hindu castes (Nayak and Berkes, 2010). As captured in the words of a community member, "Chilika represents the rice pot and the local bank of the people". This representation shows the dependence of the people on the vital coastal resource.

The interaction and operations of fisherfolks within the coastal resource base depend greatly on the caste-based system. The caste-based system afforded clear rights and entitlement, which were further enhanced through existing caste norms for using and managing the lagoon resources. However, the shrimp

aquaculture boom period (1980 and beyond) changed the existing social structure that governed the use and management of fisheries resources in the Chilika lagoon. The shrimp aquaculture favoured those who already had property, goods and money as they could quickly mobilise funds to engage in the aquaculture business, leaving out the economically vulnerable in society, who were predominantly SSFs. The financial capabilities of the rich resulted in the encroachment of fishing spaces that were hitherto the preserve of the people with less financial capabilities. The accompanying changes brought about by shrimp aquaculture and new government policies for the sector resulted in the social exclusion of SSFs from accessing the same ecological resources and benefits of the Chilika Lagoon.

Unfortunately, the decrease in fish catch has had resounding impacts on the social identity of the adjoining fishing communities. Many residents of Chilika are being forced to abandon their identity as fishers, and pursue other livelihoods such as seasonal farming, construction, homestays, and selling fish in other villages. These new pursuits require residents to leave their villages for full days, being absent from their families, friends, and community. The gender roles in many communities have also shifted, leading to more women in the workforce. In lieu of more traditional family roles, women are now working as vendors, selling small toys and souvenirs to tourists. While pursuing alternative sources of income damages social identity, it also impacts income. According to one community present in the discussions, an 8-10 hour vending day will provide roughly US\$3, while 1 kilogram of fish can be sold for US\$ 7.5, and when fish stocks were plentiful it was possible to catch multiple kilograms per day. This lack of sufficient funding is forcing many families to pursue loans to fund small vending and the pursuit of dry fish business as an alternative to traditional fishing activities.

In addition to changes in livelihoods, families are forgoing attending cultural and religious festivals due to a lack of funds available to purchase new clothing for these celebrations. The decrease in fish catch has also led to food insecurity, and an increased emphasis on education. Food insecurity has drastically changed the diet of community members, transitioning from a diet high in fish to a diet dominated by vegetables, which community members worry has increased their pesticide intake. A lack of work as fishers has made education more of a priority for many families. In the past, children would have been raised to be fishers; now, the lack of a sustainable livelihood in fishing is placing a growing emphasis on education which leads to children leaving the communities where their families live to pursue outside opportunities.

6.3. Governance

A theme that emerged throughout this field course was that of government action without consultation. Many community members who were in the discussions felt that their concerns went unheard when it came to the management of Chilika. This was the case when the new sea mouth was built, and it was also the case when the government introduced a large houseboat to the lagoon that is expected to boost tourism. The introduction of the houseboat has also resulted in restricted fishing access to certain channels so as to make them available for the houseboat to navigate. Both of these instances are examples of government action without consultation, where the impacts of those actions are felt widely throughout the fishing community. The local communities are not relying solely on the government to initiate these conversations, a woman from one community noted that the Federation of the Women's Group has spoken to the government regarding their concerns and there is yet to be a resolution. Throughout the brief consultation that this field course facilitated, it was clearly stated that the communities desire removal of the houseboat, the building of new fishing jetties, the creation of new policies regarding pollution and tourism, regulations on boat size and capacity, and better jurisdictional cooperation. Despite these frustrations, an alternative perspective of government interventions in Chilika was seen while visiting a local dry fish processing facility. This facility is community owned and heavily subsidized, requiring roughly 90% of its support from the government of India. This facility provides fishers with the opportunity to pack, market, and sell their fish to facilitate entrepreneurship and open new revenue avenues for local fishers.

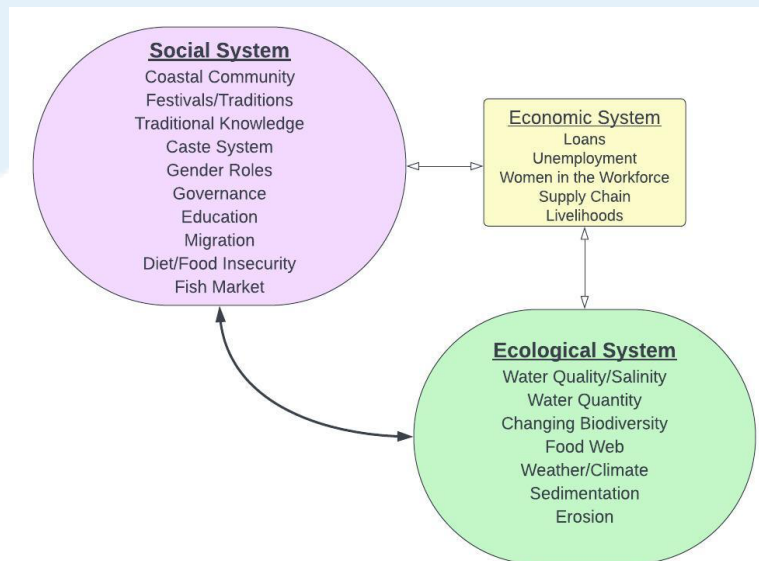
6.4 Interconnections and Complexities

The socio-cultural aspect of the interconnections between ecology and society in Chilika Lagoon reveals intricate dynamics, particularly within traditional fishing communities marginalized by the caste system. These communities, despite facing societal challenges, play a pivotal role as vital stakeholders in sustaining the lagoon's ecological balance. However, their traditional knowledge and fishing practices sometimes clash with modern conservation efforts, introducing complexities in resource management. Migration patterns within the traditional fishing communities of Chilika Lagoon reflect a socio-cultural interplay. These communities often engage in seasonal migration, moving to areas with fish processing facilities. This migration is rooted in historical practices and cultural ties, where the availability of processing facilities aligns with traditional methods of fish preservation. The out-migration of community members to areas with sea fishing signifies a socio-economic adaptation. Faced with challenges and limitations within the lagoon, individuals from these communities seek opportunities in regions with access to sea fishing. This trend reflects the adaptive nature of these communities to changing ecological and economic conditions, showcasing a dynamic interaction between societal needs and environmental resources.

The occurrence of skin diseases among community members due to contact with lagoon water adds a health dimension to the socio-cultural interconnections. Traditional fishing practices often involve direct interaction with the water, and this intimate connection is deeply ingrained in the cultural fabric. However, the manifestation of skin diseases introduces a complex challenge where cultural practices clash with the need for health and well-being. Addressing these health concerns becomes a delicate balancing act that requires considering both ecological and societal aspects. The caste-based marginalization of these communities adds a layer of complexity, as it influences social dynamics, access to resources, and the recognition of their traditional knowledge. While the traditional methods may have sustained the ecological balance for generations, the evolving environmental landscape and the need for sustainable practices require a delicate negotiation between preserving cultural heritage and adapting to contemporary conservation needs.

Figure 6

A conceptual framework where we indicate that the coastal community is a nexus of interconnected systems, where social, economic, and ecological dimensions coalesce



The conceptual framework (Figure 6) illustrates a comprehensive understanding of the coastal community's dynamics, emphasizing the reciprocal interactions between its social, economic, and ecological systems. The social system, marked by elements such as coastal community festivals/traditions, traditional knowledge, caste system, gender roles, governance, education, migration, diet/food insecurity, and the fish market, plays a pivotal role in shaping the community's identity and practices. This social system is intricately connected to the economic system, involving aspects like loans, unemployment, the participation of women in the workforce, supply chain dynamics, and various livelihood strategies. The economic activities, in turn, influence and are influenced by the social structures and traditions within the community. The ecological system, consisting of water quality/salinity, water quantity, changing biodiversity, the food web, weather/climate patterns, sedimentation, and erosion, is woven into the fabric of both the social and economic systems. This triad of systems establishes a two-way feedback mechanism, where changes in one system reverberate through the others, creating a dynamic and interconnected framework. This holistic approach recognizes the interdependence of these systems, emphasizing the need for a comprehensive understanding to address the complexities of sustainability and resilience in coastal communities.

7. Questions of Ownership

The community draws strength from integrating social and religious aspects, which plays a significant role in sustaining its cultural vitality. Cultural representation is subtly woven into their daily lives, reflecting the community's identity through conscious and sometimes small yet meaningful expressions. Similar to the embeddedness of an ideology within one's own self.

Chilika Fishers' are very much part of the Indian Caste embedded society. The rigidity of the norms followed within the system, are still abided by many, even when the system got discarded years ago. This very system, gives them the notion of unity within their ascribed social identity by birth, to cope with the severe marginalization within the trade in the contemporary times; challenged by the big entrepreneurs' who because of the rising lucrateness of the illegal aquaculture business have made a considerable advance in their trade, leaving very little room for the SSFs to thrive and to carry on with their generational old fishing practices. When exploitation remains the order of the day, under the authority of the power and economic players such as influential individuals, corporations, or governing bodies, limiting the scope of traditional practices, identity and intuition is always at stake. Forging the generational old fishing practitioners to give up on their long-cherished pride, and to bear the fear of the unknown, with very little means and almost devoid of any support and protection given by the government. Hence, the assertive minds of the Traditional fishers' question is "Chilika belongs to whom?"

Figure 7

A fisherman sorting his catch to sell in the local market



Source: Photo was captured during the Chilika - V2V Field School 2022 by Md. Emon Rahman

8. Insights for ongoing involvement

8.1 Alternative and Supplementary Livelihoods

Owing to the past and current ecological disasters and economic crisis, several communities depending on the lagoon for their livelihoods have constantly been pushed towards marginalization. Loss of livelihoods has shown its impacts on the communities in several ways including migration, debt traps, opting for illegal and unsustainable ways of fishing, and deteriorating community health. Diversification of income sources through alternative and supplementary livelihood initiatives will ensure a steady flow of capital in the households. These initiatives, when implemented with prior needs assessment studies, can be a major stepping stone to address the livelihood issues and their underlying complexities. In addition to providing financial security to the communities, this will also help in incentivising the transition from illegal and unsustainable fishing practices to more sustainable ways of harvesting the lagoon's resources.

8.2 Inclusive and Collaborative Decision-making

Local communities have previously expressed their concerns and dissatisfaction regarding significant decisions concerning Chilika Lagoon, particularly the opening of the sea mouth. Although essential for the sustainability of local ecologies and economies, proper consultation could have averted numerous issues related to the new sea mouth. Drawing lessons from past experiences, any crucial decisions about the comprehensive development of the lagoon must involve consultations with all stakeholders, representing diverse groups such as SSFs, large-scale fishers, tourism employees, women, local governing bodies, researchers, and self-help groups. To achieve holistic development for Chilika lagoon and its stakeholders, the decision-making process should consider various factors such as local ecologies, wildlife, tourism, fisheries, disaster management, and the cultural aspects of the stakeholders. Unfortunately, the organizations overseeing these factors often operate independently at an institutional level, leading to a lack of collaborative efforts. Given the extensive scope involved, it is crucial to establish interdepartmental collaborations to ensure effective planning and execution of interventions.

8.3 Community-based Conservation

Chilika lagoon is a highly biodiverse and ecologically significant part of coastal Odisha. Historically there have been several attempts made to conserve the lagoon's biodiversity. Hosting several endangered and migrant faunal species, Chilka presents substantial potential for research and conservation endeavors. There is a global shift towards moving away from colonial and parachute science, emphasizing more inclusive and community-based approaches. Community-led initiatives not only foster a strong sense of stewardship among members but also offer employment and educational opportunities. While India has seen successful community-based conservation efforts predominantly in terrestrial ecosystems, extending such initiatives to marine landscapes could lead to significant advancements in conservation. Throughout the numerous discussions conducted during this field course, the idea of community organizing was a theme that was repeatedly highlighted.

8.4 Community-led Tourism Initiatives

In our field school visits to Chilka, several community members have voiced apprehensions about larger government-owned boats dominating tourism operations, thereby diminishing the regular income of smaller boats. While it is crucial for the government to oversee ethical and sustainable tourism, it is equally important for communities reliant solely on the lagoon for their livelihoods to receive a fair share of benefits from tourism operations. Collaborative efforts with the tourism department and other local governing bodies can empower communities to contribute to a more robust and sustainable tourism model.

8.5 Education and Skill Development Programs

Recognizing the importance of empowering local communities for sustainable practices, implementing education and skill development programs is essential. These programs can focus on enhancing the knowledge and skills of community members in areas such as sustainable fishing practices, resource management, and conservation techniques. By providing education and skill development opportunities, the communities can adapt to changing ecological conditions, engage in more sustainable livelihood practices, and actively contribute to the long-term ecological health of Chilika Lagoon. Additionally, investing in education can foster a deeper understanding of the interconnectedness between human activities and ecological well-being, promoting a sense of responsibility and stewardship among community members.

8.6 Climate Resilience and Disaster Preparedness Initiatives

Given the susceptibility of Chilika Lagoon to climate change impacts and natural disasters, implementing climate resilience and disaster preparedness initiatives is crucial. This recommendation involves developing strategies and action plans to mitigate the adverse effects of climate change, such as rising sea levels and extreme weather events, on the lagoon and its communities. This can include creating early warning systems, conducting community drills, and providing resources for climate-resilient infrastructure. By preparing for potential disasters and adapting to climate change, the communities around Chilika Lagoon can safeguard their lives, livelihoods, and the ecological integrity of the lagoon. Furthermore, integrating traditional ecological knowledge into these initiatives can enhance their effectiveness and ensure a holistic approach to resilience.

9. Conclusions

Chilika Lagoon serves as a microcosm, reflecting the delicate balance between ecological preservation and socio-cultural complexities. To ensure the lagoon's longevity, a holistic approach that respects local traditions, uplifts marginalized communities, and engages in inclusive conservation efforts is imperative. Addressing the intertwined challenges of caste-based marginalization, social identity, and resource ownership is crucial in fostering a sustainable future for both the lagoon and its diverse communities. Achieving this vision will rely on community organizing. Discussions with community members showed that community cohesion is critical for influence over governance decisions, and this cohesion can be achieved through better communication and creative storytelling. This process can begin with rebuilding trust between the local communities and those with decision-making power, so that both parties can come together to identify solutions.

Acknowledgements

We extend our sincere gratitude to all those who have contributed to the successful completion of this endeavor. First and foremost, we express our deepest appreciation to the V2V Global Partnership for spearheading this initiative and providing us with the opportunity to delve into the socio-economic and ecological life trajectories of SSFs in the Chilika Lagoon. The collaborative efforts of the University of Waterloo, Canada; the Rekhi Centre of Excellence for the Science of Happiness, Indian Institute of Technology Kharagpur; and NIRMAN Odisha have been instrumental in shaping the scope and depth of our research. The firsthand experiences gained during this period significantly enriched our understanding of the local context and contributed to the robustness of our analysis. Our sincere thanks go to the local communities, SSFs, and all the stakeholders in Chilika Lagoon who generously shared their knowledge, experiences, and perspectives. Their invaluable insights have been crucial in shaping the narrative of our study. We would also like to thank field assistants Tapan, Pitamber, Magata and Pramod for facilitating the

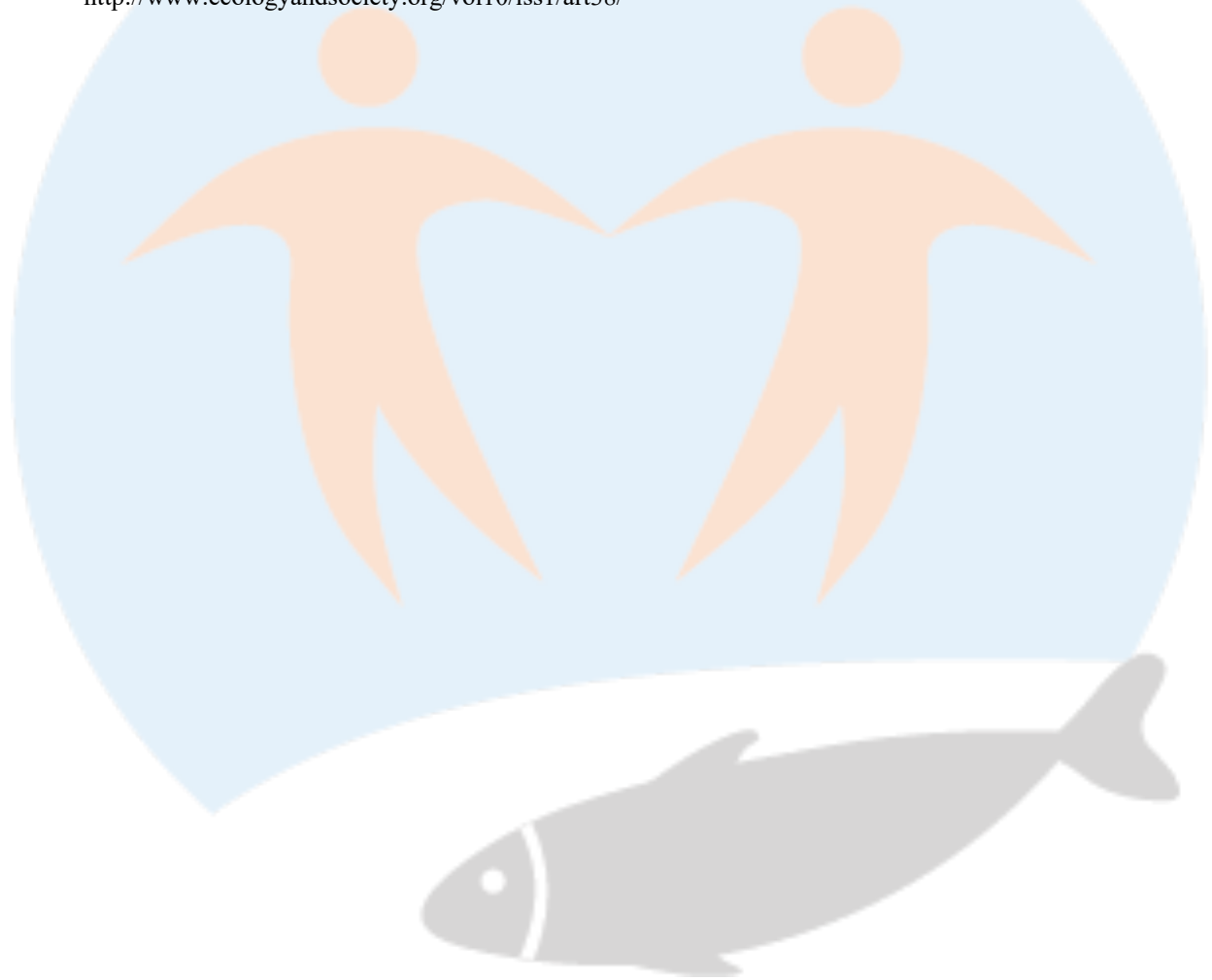
translation of Odia to English and Hindi, as well as for streamlining the interaction process with the community through their efforts. Each team member's dedication and collaboration played a pivotal role in the success of this research. This acknowledgment is a testament to the collective effort and collaborative spirit that has fuelled the success of this working paper. We are grateful for the shared commitment to understanding and preserving the ecological significance of Chilika Lagoon.



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Vulnerability to Viability (V2V) Global Partnership

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.

The V2V partnership brings together approximately 150 people and 70 organizations across six countries in Asia (Bangladesh, India, Indonesia, Japan, Malaysia, Thailand), six countries in Africa (Ghana, Malawi, Nigeria, Senegal, South Africa, Tanzania), Canada and globally. This unique initiative is characterized by diverse cultural and disciplinary perspectives, extensive capacity building and graduate student training activities, and grounded case studies from two regions of the world to show how and when SSF communities can proactively respond to challenges and creatively engage in solutions that build their viability. Further information on the V2V Partnership is available here: www.v2vglobalpartnership.org.

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