THE LIFE OF THE DELTA: A MORE THAN HUMAN ETHNOGRAPHY OF THE INDUS DELTA IN PAKISTAN

by

SUNEEL KUMAR

(Under the Direction of Laura A. German)

ABSTRACT

Deltas around the world are sinking and the Indus Delta in Pakistan is no exception. Situated at the dynamic interface between the sediment-bearing Indus River and the erosive forces of the Arabian Sea, the Indus Delta has long been shaped by the continuous interplay of fluvial and marine processes. For thousands of years, human and other-than-human lives have been intimately attuned to the temporal rhythms and flows of this deltaic environment. However, over the past century, large-scale riverine infrastructure, such as upstream dams, barrages, and irrigation canals, has significantly altered the river's behavior. These interventions have disrupted the river's velocity and sediment transport capacity, leading to a decline in soil accretion that once sustained the formation of deltaic lands. In the absence of sustained freshwater and sediment flows, marine processes have gained dominance. Saltwater intrusion, tidal encroachment, and coastal erosion have steadily transformed the fertile Indus Delta into a shrinking marine delta, transforming the everyday lives, practices, and relationships of the delta's human

and nonhuman communities. This dissertation takes a multidisciplinary and deep-time approach to examine these shifting more-than-human ontologies of the Indus Delta, moving beyond anthropocentric narratives to engage with the *longue durée* of riverine and deltaic processes. Through historical analysis, ethnographic fieldwork, and ecological observation, the research juxtaposes pre-infrastructure hydrological flows with the altered conditions produced by modern river management. In so doing, it reveals how infrastructures not only disrupt sediment dynamics and hydrology but also reshape the social and ecological fabric of the delta. By foregrounding multispecies relations and entangled temporalities, the dissertation argues for a more-than-human understanding of deltaic life. It emphasizes the need to reimagine governance frameworks that recognize the agency of rivers, sediments, fish, and mangroves, entities that have long co-constituted the delta alongside human communities. Ultimately, this research contributes to critical scholarship on environmental change, political ecology, and multispecies ethnography in riverine landscapes undergoing profound transformation.

Key words: Indus River and the Delta, ontology of water governance, South Asia, new materialism and geological anthropology, multispecies ethnography, and ontological anthropology

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Introduction

Introduction

The sinking of deltas worldwide is a well-documented phenomenon, and the Indus Delta in Pakistan is no exception (Syvitski et al. 2009). I had been reading about the degradation of the Indus Delta in Pakistani newspapers for a long time. However, in January 2010, when the people of Sindh observed "Sindhu Day" to mourn the altered flow of the Indus River and the drying of the downstream Indus, I became more aware of the situation. Participating in rallies, protests, and prayers, I listened to political and nationalist leaders, environmental NGOs, civil society members, and local fishers articulate their concerns. I witnessed people praying to Saint Khizer to restore the Indus River's flow while simultaneously lamenting the extensive riverine infrastructure upstream, which has obstructed water flow. This obstruction hinders the creation of agricultural lands, turning them arid; deprives downstream areas of essential water supply; and has particularly severe consequences for the delta, starving it of sediments. Nearly a decade later, during my preliminary research in the Indus Delta in 2019, I encountered a former fisherman who had been compelled to abandon his livelihood. Now selling miscellaneous items from a dilapidated wooden cabin on the riverbank, he emerged, took a handful of sand, and remarked, "Can you see the silt? No, it is all dry and sand… how would we cultivate in the sand? How would fish move in the sand?" His

words described the loss of mineral-rich sediments where they once had been cultivating famous red rice, vegetables, and fruits. And now the salty sand from the sea has overtaken the land. He also poignantly reflected on the ecological crisis in the delta, particularly its impact on the Indus Shad (*Tenualosa ilisha*, locally known as *Pallo*). Local people believe Pallo fish, which migrate from the sea, become Pallo only when they drink the sweet river water and eat its sediments. The Pallo has immense economic, cultural, and religious significance for the people of Sindh, especially fishing communities (Albinia 2008).

During my preliminary research, I also learned that the Indus Delta is home to a unique camel species adapted to its aquatic environment, commonly called the "swimming camels" of the delta. Traditionally herded by the Jat community, especially the Fakerani clan of Jats, renowned camel herders of South Asia, these camels thrive in the deep mangrove forests (Westphal & Westphal 1964). However, with the degradation of the delta and loss of mangrove forests, the Jats and their camels have been forced to eschew their lifeways, reshaping their lives and interspecies relationships.

Subsequent readings in fluvial geomorphology, which examine the hydrodynamic forces shaping rivers and deltas (Davidson-Arnott, 2010), provided deeper insight into the concerns of the delta's fisherfolk. Deltas are formed through sediment deposition, a process integral to their maintenance and sustainability. Scholars in physical geography and coastal geomorphology emphasize that sediment supply is "critical in terms of creating and maintaining delta structures" (Edmonds et al., 2011, cited in Passalacqua et al., 2013, p. 1838; Zoccarato et al., 2018; Ritchie et al., 2018). Marine processes such as tides, waves, and typhoons further reshape and redistribute sediments, forming estuaries,

lagoons, and creeks (Davidson-Arnott, 2010; Wright, 1985; Anthony, 2015; Nicholls et al., 2020). The absence of sediment flow due to upstream water diversions disrupts these natural processes, exacerbating the delta's ecological decline and threatening and transforming its inhabitants' livelihoods and relations.

Understanding deltaic environments requires examining the dynamic processes of soil accretion and erosion, which fundamentally shape these landscapes. Rivers deposit sediments at their mouths, gradually building land, while tidal forces, wave energy, and sea-level fluctuations contribute to erosion. Equally important is analyzing how local communities perceive and respond to these environmental transformations. How do fishers experience the shifting landscapes of their deltaic homes? How have these changes influenced their relationships with land, water, and other-than-human beings such as fish and mangroves? Additionally, the role of state and non-state governance in managing deltaic change demands critical attention. What policies and interventions are in place to address environmental degradation, and how do they affect the livelihoods and relations of those dependent on these fragile ecosystems? Investigating these questions provides a nuanced understanding of the interplay between natural processes, human interventions, and governance structures in shaping the future of deltaic regions.

To examine the impact of infrastructure on the Indus River's flow toward the delta and its consequences for both human and other-than-human beings, I broadly ask: *How do changing dynamics of soil accretion and erosion shape the physicality of the delta, and how has this transformation, in turn, influenced human and other-than-human relations in the Indus Delta of Pakistan?* Specifically, my research addresses three key questions:

1. How does the modified upstream river flow influence soil accretion and erosion in the delta, and what are the implications for humans and other-than-human beings?
2. How do local fisherfolk and governance officials perceive and interpret changes in the physicality of the delta and the shifting dynamics of other-than-human species?
3. How do these deltaic transformations align with or challenge the practices of fisherfolk and governance officials, and how do they, in turn, reshape their interactions with the delta and its nonhuman inhabitants?

I review the literature on river and delta studies in the following section, highlighting key scholarly contributions. While my research builds upon existing work in this field, it offers a distinct perspective that deepens and expands current understandings of river and delta dynamics.

Flows and Transformations: The Indus River and Delta

The Indus River emerges from Mount Kailas in the Himalayas and is 3000km long before discharging into the Arabian Sea. This long system emerged due to the collision between the Indian and Eurasian Plates around 45 million years ago (Clift 2001). The Indus River takes on its mighty nature, especially in Sindh, as it receives the waters from the Kabul River at Attock. At Mithankot, it receives the water and sediments of five other rivers. Historically, the Indus River has tended to shift towards the west (Pathiwala 1945), and according to Holmes (1964), the last significant change in the river's course occurred around 1758-1759, when the river adopted its current course to the west of Hyderabad, shifting away from Nassarpur. The lower Sindh is an alluvial plain surrounded by mountains in the west, the Thar Desert in the east, and the Piedmont

alluvial plain at the foot (Holmes 1964). The climate of the region is semi-arid, with significant variations in precipitation. Mean annual rainfall is low – around 50 to 100 millimeters; however, it can increase significantly during the southwest monsoon (July-September) (Inam et al. 2007).

The Indus Delta is one of the most dynamic deltas in the world due to its location in the active tectonic belt, causing earthquakes and inundation from tsunamis, the impact of monsoon-driven rains and floods, and cyclone-induced storm surges (Syvitski et al. 2013). The delta was created from the Indus River flows during the Holocene period. The Indus River has one of the highest sediment erosion and transport capacities, mainly due to monsoon-driven floods that transport the sediment to the river's mouth, forming the deltaic lands. In its pristine condition, the river is said to transport more than 1000 metric tons of sediments per year (Mt/y), depositing between 300-600 Mt/y into the delta (Holmes 1964). This immense amount of sediment has created deltaic lands of almost 17,000 square kilometers with fertile agricultural lands, lagoons, dense mangrove forests, estuaries, and wetlands, each hosting diverse biodiversity (Inam et al. 2007). The delta was designated a Ramsar Wetland of International Importance in 2002 (WWF 2019).

The dynamic delta can be accentuated by the fact that its river mouths have continuously changed in the past. According to geological literature on the delta, it had 12 river mouths in 1800, 16 in 1804, and 17 in 1883, which were again reduced to 14 in 1897 (Syvitski et al. 2013). All these transformations were the "natural" result of Indus River flows and their changing course, abandoning some channels and forming new channels.

Today, there is only one major river mouth in the delta. This is due to centuries of riverine infrastructure upstream. The construction of artificial levees on the Indus started during the British colonial period in 1869. By the time the massive Sukkur Barrage[1] was completed in 1932, the canal system had already extended 1500 km (Asianic Agro-Dev 2000). Today, this extensive system consists of "three mega storage reservoirs, 19 barrages, and 43 major canals with a total conveyance length of 57,000 km. There are 89,000 watercourses with a running length of more than 1.65 million km" (Inam et al. 2007, 339). More dams and barrages are under construction. For example, in 2024, the federal government announced the construction of six more canals on the Indus River under the Green Pakistan Initiative.

This interconnected network of infrastructures has substantially reduced the river's flow. While the effects are evident throughout the river basin, the delta has experienced the most profound impact, with the annual water flow into the delta reduced from more than 100 million acres per foot (MAF) to only 0.5 to 1 MAF today. This reduces the capacity of the river to transport sediments from more than 250 Mt/y to only 13-15 Mt/y, resulting in a loss of more than 25% of deltaic landforms due to erosion (Syvitski et al. 2013). The impacts of these profound transformations on the lives of and relations between humans and other-than-human beings are explored in Chapters 3 and 4. Below, I highlight the scholarly works on river and delta studies and my unique contributions to delta studies.

[1] an artificial barrier across a river or estuary to prevent flooding, aid irrigation or navigation, or to generate electricity (google dictionary).

River and Delta Studies

Two frameworks have dominated river and delta studies. The first is water-centric or hydrosocial (Wittfogel 1957; Raffles 2002; Baviskar 2013; Wagner et al. 2018; Swyngedouw 2009; Linton 2010:Krause and Strang 2016; Barnes and Alatout 2012; Hastrup and Hastrup 2016) that explores societies' fluid relationship with the rivers and deltas to develop "less terrestrocentric approaches" (Bear and Bull 2011, 2261) to river and water studies, and have urged to established a distinct field of the "anthropology of water" to examine water's materiality, ontology, and political economy (Ballestero 2019). The second approach focuses on the "social life of sediments" (Parrinello and Kondolf 2021), arguing that biotic and abiotic elements such as sediments are crucial in forming riverine and social systems (De Micheaux et al. 2018), examining how human interventions have disrupted sediment flows[2].

The delta studies or amphibious anthropology that considers the social and cultural dynamics shaped by deltaic environments—spaces that fluctuate between land and water, often subject to periods of excess water and scarcity (Krause 2017, 401) has been influenced by the above works. Amphibious anthropology focuses on "life in the river deltas" (Krause 2017; Krause and Harris 2021) with three primary analytical frameworks: (1) hydrosociality, which integrates social life with water flows; (2) volatility, which accounts for uncertain and radical transformations, and (3) multi-scalar rhythms, which highlight the layered spatial and temporal patterns shaping deltaic experiences (Krause and Harris 2021, 5; Krause 2017).

[2] Please see the reference in the special issue of Parrinello and Kondolf 2021).

South Asian scholars have explored the dynamic nature of deltas, emphasizing the cyclical submersion and re-emergence of land due to tidal movements and how humans inhabit these hybrid spaces (Samanta and Lahiri-Dutt 2013). Debjani Bhattacharya (2018) explores how hybrid spaces troubled the colonial administration's "property-thinking," which tried to categorize the land separate from the water in the Bengal Delta (see also da Cunha 2019). Rohan D'Souza (2002) examines how colonial flood protection infrastructures in the Orissa Delta were political in nature and made the delta more vulnerable to flooding (D'Souza 2002), and Camila Dewan (2021) explores how development practitioners have misinterpreted deltaic ecologies in Bengal (Dewan 2021). For Iftikhar Iqbal (2010), colonial and postcolonial policies have reshaped the social and economic structures of the Bengal Delta. (Iqbal 2010). Beyond South Asia, scholarly works have explored deltaic transformations and their impact on Indigenous communities in Colorado Delta (Muehlmann 2013); economic transformations in Vietnam's deltaic regions (Biggs 2010); economic, identity, and hydrological relations in Canada's Mackenzie Delta (Krause 2021); the effects of urbanization on Turkish delta (Scaramelli 2019). Morita and Jensen (2017), on the other hand, identify "two delta ontologies" in the Thailand Delta. The first is "aquatic," a nonwestern deltaic ontology that conceptualizes the delta as the intertwinement of land and water. The other Western ontology is "terrestrial," which operates by separating land and water (Morita and Jensen 2017). My research also builds on these works; however, it offers a significantly distinct perspective on the delta studies in many ways.

First, in my research, I focus on "life *of* the delta" rather than only examining "life *in* the delta" (Krause 2017, my italics), moving beyond a human-centered perspective.

Rather than treating the delta's hybrid environment and dynamism as static or given, I foreground the ever-changing nature of the delta, positioning it as an active and generative force at the center of my dissertation. By doing so, I seek to illuminate the intricate geological processes, forces, and intensities that shape and sustain its dynamism over time. The geological processes and forces do not merely act upon the delta. They constitute its very being, shaping its material formations and influencing the lives and relations of both human and other-than-human beings.

In doing so, and secondly, I do not take for granted the definition of a delta merely as a place where a river deposits sediments—an assumption commonly observed in river and delta studies (Richardson 2021). Rather, I foreground the flows, processes, and forces that make the delta. I aim to demonstrate how the delta is not a passive backdrop for human activity but an ever-transforming entity that emerges through its entanglements with hydrological, geological, and atmospheric forces. In doing so, my research challenges static conceptions of place and rethinks the delta as an ongoing process of becoming.

Third, scholarly discussions on the hybridity of the delta have predominantly emphasized the role of tides, how high tides submerge the land in water, and how receding tides allow land to reemerge. While tides undeniably play a crucial role in shaping the delta, they represent only one among many forces responsible for its dynamic hybridity. My research shifts this dominant focus by foregrounding the role of riverine flows in generating and sustaining the delta's hybridity. I explore how the river, through its erosional and depositional processes, continuously transforms the deltaic landscape by carrying sediments from upstream and depositing them at its mouth to form new lands.

Additionally, shifting river courses further contribute to the delta's ever-changing topography, demonstrating that its hybridity is not solely a product of tidal movements but is also deeply entangled with fluvial geomorphological processes.

In so doing, and fourthly, by focusing on the riverine flows, I eschew land (sediments) and water divide by describing the intertwinement of sediments and water in the river flows or, as local people say, the rivers carry the lands with them. To develop this argument, I engage with various fluvial and geomorphological factors that shape the delta, including river velocity, gravitational forces, precipitation, and other climatic elements. These forces interact with each other in complex ways, driving the formation, erosion, and reconfiguration of deltaic lands. By centering riverine flows in the study of deltaic hybridity, my research broadens existing understandings of the delta, positioning it as a fluid and dynamic entity shaped by multiple, interwoven processes rather than by tidal action alone.

Fifth, the dynamism of the delta goes beyond water and sediments to other geological forces, such as earthquakes, especially for the deltas, which lie at the intersection of tectonic fault lines. The Indus Delta, positioned at the convergence of the Eurasian and Indian tectonic plates, is highly susceptible to seismic activity, with earthquakes reaching magnitudes as high as 7.8 on the Richter scale. These seismic events have historically played a critical role in reshaping the delta's geomorphology, influencing the river's course and the broader deltaic landscape. Major earthquakes have been responsible for altering fluvial pathways, redirecting river channels, and causing sudden land subsidence or uplift. Such disruptions can lead to new wetlands, the disappearance of previously stable landforms, and even the formation of new estuarine

features. These transformations demonstrate that the delta is not solely a product of hydrological and sedimentary dynamics but is also deeply influenced by subterranean geological forces. By incorporating seismic activity into understanding the delta's dynamism, my research highlights the interplay between geological forces and riverine processes, presenting a more comprehensive view of how the Indus Delta continuously evolves as a complex and unpredictable landscape.

Sixth, I argue that upstream riverine infrastructures, alongside water governance and politics such as the Indus Water Treaty (IWT), which governs water-sharing between India and Pakistan, interact and interplay to significantly disrupt the Indus River's natural geological and fluvial processes. These human interventions alter the river's capacity to transport water and sediment downstream, ultimately reshaping the geomorphological and hydrological characteristics of the river and, in particular, the Indus Delta. Foregrounding this interaction between water governance, politics, and geological processes is essential to understanding the complex ways in which human interventions, regulatory frameworks, and natural dynamics shape river systems, influence sediment flows, and impact both ecosystems and communities that depend on these environments.

Finally, I show how the shifting riverine and deltaic processes and forces transform human and nonhuman practices and relations. The transformation of the Indus Delta due to reduced freshwater flow, sediment depletion, and increasing saltwater intrusion has far-reaching consequences for humans and nonhumans (mangroves and fish). Mangrove forests, which serve as crucial buffers against coastal erosion and provide habitat for marine life, are particularly vulnerable to these changes. As river

flows, water, and sediments decrease, endangering mangrove ecosystems and disrupting the delicate balance necessary for their survival.

Similarly, the decreasing river flow disrupts the migration of the Pallo fish, which journeys from the sea upstream to spawn. This ecological disruption has profound implications not only for the fish population but also for the cultural and spiritual practices of local communities. For local fishers, the Pallo's migration is an annual pilgrimage to the shrine of Saint Khizer, the guardian of waters. The dwindling river flow, caused by upstream infrastructural interventions and water diversions, obstructs this sacred journey, reshaping the fish's relationship with the delta and altering the rhythms of local life. This sense of rupture is captured in the frustration expressed by fishers, as referenced in the introduction. In the following section, I will write about the theoretical framework employed. In so doing, I also highlight my contribution to different theoretical frameworks beyond river and deltaic studies.

Literature Review and Theoretical Framework

This research explores the *processes* and *forces* that make and unmake deltascapes – the watery landscapes of the delta and its human and other-than-human relations. I argue that an understanding of the delta in its multiplicity as a geological, hydrological, multispecies, political, and social space rather than as a space primarily defined by scientific, technological, and administrative frameworks in colonial and postcolonial governance (Morita 2017). Thus, a framework incorporating the delta into its multiplicity requires amalgamating different theories. I do so by intertwining the theories of new materialism, multispecies ethnography, ontological anthropology, and political ecology. Such a framework allows us to view the ways inhuman processes and

forces interact and interplay with human and other-than-human beings' practices, to reshape relations in the delta.

New Materialism

I employ new materialism and the cognate field of geological anthropology to study the deltaic processes and forces in shaping soil accretion and erosion. New materialism embraces a non-anthropocentric view of the matter and argues for viewing the matter with inherent capabilities of shaping the world around us (Gamble et al. 2021; Coole and Frost 2010). Among various facets of new materialism, performative new materialism views the world as mutually constitutive. For them, ontology (what reality is), epistemology (how we know about reality), and ethics (how we engage with the world) are co-implicated. In other words, performative new materialism views the world ethico-onto-epistemo-logically (Barad 2007). In such an understanding, matter is always seen in relation to others and as a force. As Diana Coole and Samantha Frost argue, matter is "an excess, force, vitality, relationality, or difference that renders matter active, self-creative, productive, unpredictable (Coole and Frost 2010, 09).

Such performative new materialism allows scholars to focus on the "multiple forces, processes, and properties" of the world as a pervasive force that shapes biotic life (Clark and Gunaratnam 2016, 16; Connolly 2017; Khan 2019). This perspective moves beyond rigid, deterministic frameworks and instead underscores how planetary geological processes and forces coalesce to influence living systems. Scholars in this field argue that environmental and climatic transformations, economic systems, and political structures do not act in isolation but operate as intertwined processes that condition life at multiple scales. These forces manifest in diverse ways, from shaping ecosystems and biodiversity

to influencing human societies and governance. By considering these multidimensional interactions, researchers challenge reductionist views and advocate for a more nuanced understanding of how the "self-organizing amplifiers and internal volatilities of planetary processes" (Connolly 2017, 16) "can perturb and excite" (Clark 2011, xiv) human plans and conventions.

Scholars debunk the division between life and nonlife (Povinelli 2016; Yusoff 2018). Such a division for them was biased and a requiem to late liberalism. Elizabeth Povinelli (2016) addresses the division through the concept of "geontopower," which is "a set of discourses, affects, and tactics used in late liberalism to maintain or shape the coming relationship of the distinction between Life and Nonlife" (Povinelli 2016, 04). Geontopower functions to foreground how life, in contrast to Western biology, is imbued in all existence and how difficult it is to find a language that can discern life beyond biology (Povinelli 2016, 05). Grosz (2011) tackles a similar question when she asks, "What is life?" For Grosz (2011), life is "creative utilization and elaboration of natural resources and that which brings unexpected transformations to the environment that intensify its forces" (Grosz 2011, 03). For Deleuze and Guattari (1987), life is the assemblage of three strata, each with its histories, forces, and trajectories: the inorganic or geological, the organic or biological, and the alloplastic stratum of human culture and language. Influenced by these works, new materialist scholars have shifted focus on geology's first strata to explore geological and planetary dynamics and historical trajectories of the earth itself and its implications for social life (Clark and Yusoff 2017).

These geosocial formations have allowed scholars to explore the geopolitics of the earth (Serres 1995), to ask what happens when humans are exposed to earthly forces,

and to think with Indigenous people about rocks as "semiotic agents" (Povinelli 1995, 06) and explore "geo" as the very condition of life (Grosz, Yusoff, and Clark 2017). Such attentiveness to geosocial formation is to tell the "geostories" (Latour 2014) or "geopower" stories that are the energizing, excessive, and differential forces of earth and cosmos that provoke humans and other living beings into new forms of collective expression and make political power possible (Yusoff 2017). Focusing on earthly *processes* to explore their capacities to "affect and be affected by" other processes and events, including humans and other-than-human beings (Deleuze and Guattari 1987 [2004]; Barad 2007; Ingold 2012; Grosz 2017), this view of the material allows scholars to explore how materiality "creates and entraps the living world" (LeCain 2015, 16).

How living beings are entrapped in the broader world and with each other is the recurring theme of multispecies ethnography, the another approach I employ in this research.

Multispecies Ethnography

Multispecies ethnography (MSE) foregrounds previously marginalized other-than-human beings as protagonists in ethnography (Kirksey and Helmreich 2010). Scholars have been exploring assemblages of human and other-than-human beings and the ways diverse living beings have been shaping human lives, politics, culture, and economies (Tsing 2015; Candea 2013; Kirksey 2015; Keck 2020; Hayden 2003; Paxon 2013; Hartigan Jr. 2017; Lein 2015), and Indigenous ontologies of multispecies relations (Bird-David 1999; Viveiros de Castro 1998; Kohn 2013; Davis and Todd 2017). For some scholars, the key question is how the lives and forms of nonhumans conform to and/or evade human plans and conventions. De Carvalho Carbal (2013) shows how the

leaf-eating ant in Brazil troubled the colonial administration's agricultural plans as they ignored the particularities of local lands and their multispecies world. Vaughn (2017) shows how mangroves do not always align with government strategies in Guyana's climate change adaptation plan. Instead of consistently supporting these plans, mangroves create "moments that sometimes lead to new insights but, in other cases, result in dead ends" (Vaughn 2017, 244). Kohn (2013), on the other hand, explores how the form of a rubber tree helped colonialization to expand geographically in the Amazon. The form of a species, argues Tsing (2014, 32), is a biography – a history of social relations through which they have been shaped, and attention to form and assemblages can make those histories visible. Such multispecies histories reveal how human and other-than-human beings have been entangled in this world (Tsing 2014, 15; Raffles 2002).

Anthropologists working across the field of multispecies ethnography are wary of power relations inherent in the politics of representation (Spivak 1988; Appadurai 1988). Hence, from the very beginning they ask important questions such as, "How can or should or do anthropologists speak with and for nonhuman others?" (Kirksey and Helmreich 2010, 254). Multispecies ethnography scholars call for being wary of assuming the role of "spokespeople" for nonhumans. In fact, for them, putting nonhumans in opposition to humans or allowing humans to 'represent' nonhumans falls into the representationalism and human exceptionalism traps that they reject (Haraway 2008). Thus, the goal of "multispecies ethnography should not just be to give voice, agency or subjectivity to the nonhuman—to recognize them as others, visible in their difference—but to force us to radically rethink these categories of our analysis as they pertain to all beings" (Kohn personal communication, cited in Kirksey and Helmerich

2010, 563). In this view, the ethnographer does not stand in for the nonhuman but becomes a witness to multispecies worlds, acknowledging their agency without claiming to speak their voice. For instance, Haraway (2008, 2016) argues against "the hubris of the human exceptionalist spokesperson," insisting instead on "staying with the trouble" and engaging in response-ability, a form of situated ethical attunement where the human does not speak for the nonhuman but with them, in messy, partial, and ongoing relations. Such understandings undergird multispecies scholars' use of concepts of assemblages (Tsing 2015), entanglement (Raffles 2002), relationality (de la Cadena 2015; Kohn 2013), interspecies (Tsing 2012) and others as central to discerning human and nonhuman relations.

MSE is also revamping conservation practices (Aisher and Damodaran 2006). Some scholars working in this vein have called for considering the lively biogeographies of humans and nonhumans in conservation practices (Lorimer 2010). Others highlight the saliency of Indigenous cosmologies, arguing that they should not be reduced to Indigenous knowledge only but treated as a way of life and its conservation importance. Roncoli et al. (2009) argue that in Indigenous cosmologies, "Animals, mountains, glaciers, and other landscape features are conceived by local people as more than assets to be managed or measured. They are rather to be embraced as part of a moral universe that includes both humans and nature, and their decline, due to unsustainable use or to climatic change, is mourned as a loss of cultural identity and meaning" (2009: 97). For example, Locke (2017) shows the value of Nepali mahouts who consider elephants as persons, and the role of such intimate relationships in conservation (see also Milton 2003; Munster 2016; Singh 2018; Archambault 2018). A few scholars are exploring non-

Western relational ontologies in which nonhuman beings are seen as people or have an agentive character and their importance in conservation practices (Rocheleau and Roth 2007; Escobar 2016; Blaser 2018).

Thus, for multispecies scholars, it becomes essential to explore the intimate ethos of relations among humans and other-than-human beings in a world haunted by the monsters and ghosts of capitalism (Tsing et al. 2017). Where scholars have shown how the capitalists' ruins have ruined the landscapes[3], other scholars have demonstrated the hope in hope in blasted landscapes (Kirksey et al. 2013; Kirksey 2015). At the same time, attuning to the kinds of multispecies relations a landscape has sustained in the past and emerging new relationships can reveal the broader ecological, social, and political transformations shaping the environment. By examining historical interactions between humans, animals, plants, and other non-human entities such as rocks, rivers, and mountains, we gain insights into how landscapes have evolved in response to climatic shifts, resource use, and governance structures. Furthermore, recognizing emergent multispecies relationships allows us to rethink environmental stewardship and conservation, guiding more inclusive and ecologically attuned approaches to managing landscapes. Ultimately, this perspective challenges human-centered narratives and underscores the entanglement of life forms in shaping and sustaining shared environments.

Ontological Anthropology

Ontological anthropology emerges by responding to "certain conceptual problems and contradictions that arise as anthropology thought faces new challenges" (Kohn 2015,

[3] Please see Tsing et al. (2023) digital book called The Feral Atlas. https://feralatlas.org/

312). These contradictions largely emerge from the current global ecological crisis and ask critical questions about why it matters what concepts we use to think about the world (Holbraad 2010; Holbraad et al. 2014; Viveiros de Castro 1998). Scholars begin with a proposition of multiple ontologies – or that a "world of many worlds" exists (de la Cadena and Blaser 2018) and argue that "depending on specific actors involved, ontologies are practiced differently and thus are materially different as such" (Papadopoulos 2018, 11). Western conceptualization of the world emerges in and through Western dividing practices (Descola 2013; Latour 1993). However, other Indigenous and non-Western people world may emerge in and through different practices, and they may conceptualize and enact the world differently (Strathern 1988; Latour 1992; Viveiros de Castro 1998).

Thus, the main argument of ontological anthropology is that "ethnographic descriptions, like all cultural translations, necessarily involve an element of transformation or even disfiguration" (Holbraad et al., 2014). Hence, equivocation is at the heart of anthropological practices, which Viveiros de Castro (2004) explains is a "disjuncture communication" – which happens when two interlocutors are talking about the same entity but evoking completely different worlds (see also, de la Cadena 2015). He argues that we cannot cancel this equivocation as "it is the constitutive dimension of cultural translation" (Viveiros de Castro 2004, 10), but can "control" (Viveiros de Castro 2004, 03) it by avoiding the practices that force this incommensurability to be commensurable through the concepts at our disposal. For example, the Western human/nonhuman divide presupposes nonhumans cannot be social (Latour 1993). On the other hand, many non-Western Indigenous societies do not divide humans and

nonhumans. For them, nonhumans are people and thus are social. In such a situation, Western concepts may not render these social worlds adequately. Ontologically, it is essential to question the concepts of human, nonhuman, and sociality (among many others) by exploring how these concepts emerge differently and how such a difference creates a different understanding of sociality and, hence, of the world. Holbraad succinctly states that the concepts at our disposal may be "inadequate even to describe our data properly, let alone to 'explain' or 'interpret' it" (Holbraad 2010, 180). Thus, "it is to communicate by differences, instead of silencing the Other by presuming a univocality, the essential similarity, between what the Other and We are saying" (Viveiros de Castro 2004, 10; see also Blaser and de la Cadena 2018). This can be done through "controlled [ethnographic] experimentation" (Viveiros de Castro 1998), that is, allowing new concepts to emerge to make the world visible otherwise, which modern concepts have obscured to us. These concepts [worlds] otherwise are "symptomatic and diagnostic" to modernity as it refuses to surrender to the concepts and worldviews of modernity (Povinelli 2016). Ontological anthropology takes a radical position by arguing that rather than engaging with the details of current problems only, the redemption of anthropology is in providing alternatives to the modern world (Latour 2013; Descola 2013).

These theories have circulated separately within academic discourse for more than a decade. However, as a research agenda, they intersect in multiple ways, offering critical insights into the dominant frameworks of knowledge and power. They challenge Western dualism and representations that separate nature from culture, humans from non-humans, and mind from body, arguing that such binaries limit a holistic understanding of the

world. Additionally, they criticize the dominance of epistemology over ontology, emphasizing that ways of knowing should not take precedence over ways of being. These perspectives also question the centrality of man, particularly certain privileged men, as the ultimate measure of all things, challenging the anthropocentric biases embedded in modern thought. Furthermore, they argue that the contemporary ecological crisis is not a random or inevitable outcome but rather the result of a specific "civilizational model that of patriarchal Western capitalist modernity" (Escobar 2018, ix). By addressing these foundational issues, these theories call for a fundamental rethinking of human and non-human relations, advocating for alternative ways of living that are more just, relational, and ecologically attuned.

Scholars have been arguing to unite these theories. Anna Tsing (2019) called for an ontological multispecies turn to combine ontological anthropology and multispecies ethnography. Similarly, other scholars calling for a "political geoecology" (Dalby 2016: 34) and geological anthropology (Oguz 2010) to bring together new materialism and political ecology to explore "geological life" – that is, the "corporeality of geology as a material embodiment…that has geopolitical and biopolitical consequences for the possibilities of being and nonbeing" (Yusoff 2018, 03).

I bring these theories – new materialism, multispecies ethnography, and ontological anthropology together to shift the anthropological gaze from humans to forces, processes, and forms surrounding humans and nonhumans. This framework is salient as "in one swoop it deals with the problem of anthropocentrism, it avoids the fetishizing of the nonhuman, [and] it takes up myriad elements (humans, nonhuman

beings and geological processes in their complex configurations" (Khan 2019, S333; see also Connolly 2017).

Further, where these theories eschew Western dualism, I argue that complete rejection of the nature and culture model can be akin to moral imperative leading to intellectual policing that assumes dualistic thinking is inherently flawed (Kirby 1999, 27-28). It also traps in the same dualism that these theories eschew, where a natureculture paradigm is opposed to nature and culture models. I argue for a more nuanced approach. Rather than viewing the rejection of dualism as absolute, it is essential to recognize the conceptual value of both models. Nature-culture paradigm and the integrated natureculture framework are not mutually exclusive but offer complementary lenses for understanding socio-ecological systems.

Following Bialecki (2019), who contends that the "unimaginably ancient beginnings help validate a nature/culture dichotomy" (100) and that the features of the current ecological crisis informed by a particular (Western) civilization model become visible only when juxtaposed with deep temporal scales (100). I adopt a "deep time" approach (Irvine 2020) to analyze the formation of the Indus River and its delta before human settlement and exploitation. This perspective underscores the salience of natural and cultural entanglements and the natureculture paradigm.

Methodology and Research Sites

This research employs a multi-sited and interdisciplinary approach (Corson et al. 2014; Marcus 1995; O'Neill et al. 2013) to examine how colonial and postcolonial riverine infrastructures have shaped and reshaped the physicality of the Indus Delta and, in turn, transformed human and more-than-human relations. Ethnographic fieldwork was

conducted in multiple locations – Keti Bunder, village Muhammad Siddique Jat, KharoChann, and Karachi and Islamabad urban centers. Keti Bunder is a historically abandoned port town that now serves as a central place for fishers to sell their fish; hosts an office/guesthouse of the Sindh Forests Department and is also a central point for many government and conservation organizations working the delta and is a central place for the fishers living the deep creeks to commute to other places via local transportation. I engaged with the fishers who visited Keti Bunder, and this interaction provided great opportunities to listen to stories of soil erosion, their lives and experiences. It also provided opportunities to engage with the government and conservation organization officials and develop "rapport" (Barnard 2017) with them.

Village Muhammad Siddique Jat is the village of around 142 households of Fakerani Jat, who nurse the swimming camels of the Indus Delta. They were a nomadic tribe that used to live in the mangrove forests and would travel to nearby forests during winter. However, since the degradation of the Indus Delta and mangrove forests, they migrated and established this village in 1994. Today, Jats live in this village, while their camels, which have been reduced from hundreds of thousands to only fifteen to twenty thousand, live in the mangrove forests with five to ten caretakers. Many Jats are now involved in fishing, a few work on daily wages in nearby towns, and others are engaged with the forests department to plan mangroves. Living with them in the village provided valuable insights into the past life of the delta when the river was flowing and interrupted, and the delta had dense mangrove forests.

Finally, the village KharoChan is another important village situated at Khober Creek, the last creek where the Indus River still flows during flooding season. I lived in

KharoChan and periodically visited other nearby villages of Khober Creek to conduct interviews with fishers and participate in fishing. During flooding season, Pallo still migrates upstream from this creek, and participation in observation and conducting interviews during Pallo fishing provided great insights into the local fishers' ontology and change in it over time.

Karachi is the provincial capital of Sindh. Head offices of various government and nongovernment organizations are located in Karachi, such as the Sindh Forest Department, World Wildlife Fund (WWF), International Union for Conservation Network (IUCN), Pakistan Meteorological Department, Sindh Fisheries Department, and Sindh Archives. In Karachi, I interviewed directors, managers, field officers, and other relevant people working in the Indus Delta. Islamabad is the federal capital of Pakistan, where I only worked with the Indus Water Commission office to collect the river flow data over time. Each chapter of this dissertation outlines specific methodologies in greater detail. This section provides a broader overview of the research processes, data collection strategies, and fieldwork approaches.

Fieldwork commenced in January 2020; however, due to the COVID-19 pandemic, all research activities were suspended by the University of Georgia's Institutional Review Board (IRB). The Wenner-Gren Foundation further required researchers to develop contingency plans for fieldwork under pandemic restrictions. Given these constraints, I reconceptualized the Indus Delta as a research subject (Wagner et al. 2018). I sought to "trace" and "follow" (Haraway 2016) both human and nonhuman actors in the delta through alternative methodologies.

I employed *patchwork ethnography* as a framework to adopt in the restricted situation of Covid-19. Patchwork ethnography refers to ethnographic practices that rely on short-term field visits, fragmented yet rigorous data collection, and methodological innovations that resist the fixity and holism traditionally associated with ethnographic fieldwork (Gunel et al., 2020). This approach prompted a critical interrogation of the boundaries between "home" and "field" and enabled the conceptualization of the researcher's own locale as a field site. To consider "home" as a field, I engaged with the 'concept' of the Indus Delta beyond its physical confines to locate it in various sources. Such as scholarly journal articles, news reports, videos, images, blogs, vlogs, official documents, personal accounts, travelogues, poetry, folklore, and NGO reports. Rather than treating these materials solely as secondary sources or literature reviews, I approached them as subjects in their own right. I aimed to explore how the Indus River and the Delta is conceptualized in these sources. For example, reading fluvial geomorphology literature on the river and delta was to explore how geomorphologists explain the riverine and deltaic processes and understand what kind of delta emerges in such literature. Such an approach enabled a critical engagement with the emergent multiplicities of the delta in various sources. This strategy aligned with the assertion that anthropological research cannot be confined to a single site or singular source material (Rutherford 2020[4]; Gunel et al. 2020; Pandian 2019).

Additionally, I established connections with conservation NGOs, the Sindh Forest Department, the Sindh Fisheries Department, and the Pakistan Meteorological Department in Karachi, as well as the Indus Water Commission in Islamabad. These

[4] https://americanethnologist.org/online-content/collections/covid-19-and-student-focused-concerns-threats-and-possibilities/funding-anthropological-research-in-the-age-of-covid-19/ as accessed on June 2023.

institutions provided crucial hydrological, meteorological, and ecological datasets, including Indus River hydrological data from KalaBagh to Kotri Barrage, mangrove cover data from the Sindh Forests Department, climatic records from the Pakistan Meteorological Department Karachi, and fish catch data (notably *Pallo* fish) from the Sindh Fisheries Department. At home, I also conducted telephonic interviews with the local people of the Indus Delta over the telephone, with whom I developed contacts during preliminary fieldwork in 2019.

By November 2020, my IRB approval was reinstated under a hybrid fieldwork plan. At this point, travel restrictions in Pakistan had eased, allowing for the resumption of in-person research while adhering to guidelines issued by the UGA IRB and the World Health Organization (WHO). Given the geopolitical sensitivities of the Indus Delta—situated near the India-Pakistan border and subject to heavy militarization—I exercised caution in accessing the region despite obtaining the necessary administrative permissions. I initially embedded myself within a conservation organization operating in the delta to mitigate potential restrictions. This strategy had multiple advantages: first, it facilitated participant observation within the conservation sector, enabling an analysis of how such organizations conceptualize and engage with the delta and its human and more-than-human communities; second, traveling with an established organization ensured greater security and logistical access to the region; and third, this approach provided an avenue for community engagement.

For instance, during a field visit with conservationists mobilizing local communities for mangrove plantation initiatives, I introduced myself to village members and established relationships that later facilitated deeper ethnographic engagement.

Rather than conducting a traditional village ethnography, I followed deltaic processes—tracking sites affected by erosion, soil accretion, and riverine changes. If villagers were migrating due to soil erosion, I traveled to their villages to document their narratives and experiences. Likewise, when I learned that Indus River water had reached Khober Creek—one of the last remaining active discharge points of the river into the sea—I traveled there to observe *Pallo* fish migration, monitor soil accretion, and document ecological changes.

Ethnographic engagement in Keti Bunder was characterized by a combination of "deep hanging out" (Geertz 1998) to participate, observe, and conduct interviews. For example, during a preliminary research trip, I attended a mangrove plantation workshop conducted by a conservation organization at the Sindh Forest Department office in Keti Bunder. Here, I met a camel herder from Muhammad Siddique Jat village, who provided critical insights into how conservation efforts, particularly mangrove afforestation, have impacted traditional herding practices. This encounter provided initial insights into camel and mangrove intimate relationality, which was followed up during extensive fieldwork. Similarly, conversations with fishers at Keti Bunder returning from the deep creeks of the delta offered valuable perspectives on ecological transformations and socio-environmental dynamics.

At Muhammad Siddique Jat village, I engaged in more immersive ethnographic participation, residing in a bamboo tent among camel herders. Here, I documented oral histories detailing how environmental degradation and mangrove loss have compelled Jat communities to abandon their nomadic lifestyle and settle permanently. Through extended field stays in the mangrove forests, I observed herding practices, accompanied

herders as they rotated camel grazing sites, and participated in daily activities such as cooking, eating, and drinking camel milk while listening to stories about past and present deltaic transformations.

In sum, this research integrates multi-sited ethnographic methods with an interdisciplinary analytical framework to explore the entanglements between riverine infrastructures, ecological transformations, and human and more-than-human relations in the Indus Delta. The methodological approach—combining patchwork ethnography, participant observation field visits, and interviews—enables an examination of deltaic processes not as static entities but as dynamic formations continually shaped by geological, hydrological, and socio-political forces.

Multiple Lenses - Integrative Methodological Approach

This research incorporates multiple disciplinary perspectives as part of the Integrative Conservation (ICON) Program. The ICON handbook defines integrative research as employing "multiple ways of approaching a problem to highlight more than one dimension of its complexity, thus providing a more comprehensive understanding of the problem" (ICON Handbook 2023, n.p.)[5]. In line with this framework, I adopted a multidisciplinary approach, integrating theoretical and methodological perspectives from geology to fluvial geomorphology, river ecology (environmental flows), anthropology, and history.

I engaged with published geological literature on the Indus River and the Indus Delta to develop a geologically informed perspective. This literature facilitated a *deep-*

[5] https://cicr.uga.edu/wp-content/uploads/2023/10/ICON-Handbook_09282023.pdf as accessed on February 23, 2025.

time approach, enabling an understanding of the ancient geological processes—such as tectonic collisions, earthquakes, and mountain formation—that contributed to the creation of the Indus River and its deltaic landscape (Syvitski et al. 2013; Clift 2002; Haq et al. 2023; Giosan et al. 2006; Holmes 1968; Wells and Coleman 1985).

Fluvial geomorphology provided critical insights into the dynamics of riverine processes. To develop a foundational understanding, I completed a course in fluvial geomorphology at the Department of Geography at the University of Georgia, followed by an extensive review of peer-reviewed literature on the Indus River and its delta. This research illuminated the mechanisms through which rivers flow, shift, and transform their morphology over time. For instance, as the Indus River traverses Sindh, it transitions from a braided channel in its upper reaches to a meandering form downstream. Understanding these transformations required an analysis of erosional and depositional processes and sediment transport dynamics. A pivotal concept in fluvial geomorphology, succinctly articulated by G.K. Gilbert in 1884, explains delta formation: "The capacity and competence of a stream for the transportation of detritus are increased and diminished by the increase and diminution of the velocity [of the river]" (cited in Wright 1985, 9). This principle was instrumental in allowing me to identify the effects of the interplay between climate variability, precipitation patterns, river morphology and slope, and anthropogenic interventions such as dams, barrages, and other hydrological infrastructures that regulate river velocity and sediment transport.

River ecology, especially Environmental Flows (EF), further helped me understand the relationship between river flow and the different lives and practices that depend upon it. EF measures the "quantity, timing, and quality of water flows required to

sustain freshwater and estuarine ecosystems and the human livelihood and well-being that depend on these ecosystems" (Brisbane Declaration 2007; Arthington 2012). EF tells the basic principles and ecological consequences of changing water regimes in the fluvial system (Postel and Richter 2003) to underscore the importance of flow regimes, or "minimum flow," to sustain biodiversity and services the flow regime provides (Arthington 2012). Moreover, EF also focuses on the cultural flow, which includes cultural water requirements in environmental flows for the communities whose rituals and cultural practices depend upon the flow regimes (Lokgariwar et al. 2014). Thus, methodologically, EF looks at hydrological data, focusing on how much water flows temporally across the riverbed. Temporal hydrological data overlaps with habitat modeling, also called functional analysis, to determine which species need how much water and when. Collecting and analyzing the change in species and changes in flow data can yield important insights into the river ecology and the life history of diverse species (Tharme 2003). For example, species such as Pallo migrate from the sea to the upstream river while spawning. They need water flow during critical migration periods (Waldman 2003; Flecker et al. 2010). Knowing the time, quality, and quantity or the "minimum flow" required for Pallo migration to travel upstream is essential to sustain aquatic ecosystems and the species that depend on them. Environmental flow assessments help ensure that water management strategies account for the needs of migratory fish like Pallo, preventing habitat degradation and supporting ecological balance. By maintaining appropriate flow levels, environmental flow policies contribute to biodiversity conservation, enhance fisheries, and sustain the livelihoods of communities that rely on these water systems.

In addition to geomorphological and river ecology analyses, I conducted archival research at the British Library in London and the Sindh Archives in Karachi. This research sought to investigate British colonial documents and policies concerning the Indus River. I discovered memoirs and travelogues authored by British Army officers who visited the Indus Delta in the early 18th century, before the formal colonization of Sindh. Two significant accounts are Captain Alexander Burnes, who visited the Indus Delta approximately eight years after the 1819 earthquake, and Lieutenant T.G. Carless, who conducted an extensive survey of the Indus River and the Delta in 1836-38. Their extensive memoirs thoroughly examine the river flows and its changing courses, people living in the delta, and the earthquake's impact on the delta's physical landscape,

These historical travelogues offer rare and invaluable insights into the pre-modern hydrology of the Indus River and its delta before large-scale infrastructural interventions such as dams, barrages, and irrigation networks. Written by travelers, explorers, and the British colonial administrators, these documents capture firsthand observations of the river's natural flow, seasonal flooding patterns, and sediment deposition processes. Their descriptions of the Indus River's fluctuating courses serve as critical historical data points, allowing for reconstructing the delta's ecological and socio-political history.

Before the advent of modern river engineering projects, the Indus River exhibited a dynamic and ever-changing character, shaping the livelihoods of deltaic fishing communities that depended on its seasonal hydrological cycles. This research reconstructs the river's ecological past by analyzing these historical records. It examines how colonial and postcolonial development policies have altered the Indus River's

hydrology, reshaping its physical landscape and the socio-economic conditions of local communities.

Ethnographic engagement with local fishers and camel herders in the Indus Delta constituted a central component of my research. This approach was essential for understanding the intricate and evolving relationships between human communities and the delta's shifting ecological and hydrological conditions. Through participant observation, semi-structured interviews, and oral, I sought to document these communities' lived experiences, knowledge systems, and adaptive strategies in response to environmental changes, particularly those driven by riverine and deltaic transformations.

My fieldwork involved extensive engagement with fishing communities across multiple locations, including Keti Bunder, KharoChann, and other villages along the delta's creeks and estuarine systems. Fishers provided critical insights into the changing hydrology of the Indus River, particularly the decline in freshwater flows, increasing saltwater intrusion, and its impacts on fish populations, including the migration patterns of *Pallo* fish (*Tenualosa ilisha*). The oral histories of fishers revealed how the reduction in river discharge due to upstream water diversions—such as dams and barrages—has fundamentally altered the delta's ecosystem, affecting fish stocks and livelihoods. While in the field, I accompanied fishers on fishing expeditions, observing their traditional methods, including using nets and boats designed specifically for the delta's unique tidal and sedimentary conditions. These expeditions allowed for in-depth discussions on how fishers perceive environmental shifts, the historical abundance of fish species, and their contemporary struggles with depleting resources.

Beyond fishing communities, I also conducted ethnographic research, participation observation, and semi-structured interviews with the Jat camel herders of the delta, particularly in the village of Muhammad Siddique Jat. The Jats have traditionally been a nomadic group, herding camels across the delta's mangrove forests and saline mudflats. However, due to the degradation of mangrove ecosystems and changes in land use, many Jat families have transitioned to a more settled lifestyle, establishing permanent villages rather than continuing their migratory patterns. Through extended stays in the village, I conducted participant observation by accompanying herders into the mangroves, where they grazed their camels and navigated the delta's intertidal zones. These excursions provided an opportunity to understand the camel herders' relationship with the landscape, their knowledge of mangrove ecosystems, and their perspectives on conservation efforts, including government-led mangrove reforestation projects.

A recurring theme in my discussions with Jat herders was the impact of conservation policies on their traditional practices. While government and NGO-led initiatives promote mangrove plantations to mitigate coastal erosion and climate change, herders frequently expressed concerns that these plantations disrupt grazing routes and limit access to critical pastureland. Their narratives highlighted the often-overlooked consequences of conservation programs that inadvertently marginalize local communities and their livelihoods. By listening to their stories and engaging in daily activities such as herding, cooking, and drinking camel milk in the mangroves, I gained a deeper understanding of the socio-ecological tensions shaping contemporary life in the delta.

This ethnographic work underscores the importance of integrating local knowledge into broader environmental and conservation discourses and practices. Fishers and camel herders, as primary stakeholders in the delta, possess a wealth of ecological knowledge that can inform sustainable management strategies. Their narratives and relationalities? provide a counterpoint to technocratic approaches to river and coastal management, emphasizing the need for policies that recognize and accommodate the lived realities of those most affected by environmental change.

Chapter Outline

This introduction (Chapter 1) highlights the overall dissertation research, including the motivation behind the research, the questions formulated, the theoretical and methodological framework employed, the methods used, and the major contribution of this research. Since each chapter extensively reviews the relevant literature, the introduction describes the literature in a broader sense. It introduces current research on river and delta studies and what my research contributes to river and deltaic studies. In the later part of the chapter, I further highlight the three theories I employed: new materialism, multispecies ethnography, and ontological anthropology, and highlight contributions in each of these theories. Moreover, in the first chapter, I also highlight how COVID-19 posed challenges to my fieldwork and data collection and the strategies I employed. I followed the "patchwork ethnography" (Gunel et al. 2020) that argues for making "home" your field site. In so doing, my research was "mediated to a great extent by paper" (Hull 2012, 27). Finally, chapter one introduces the multidisciplinary approach to understanding the rivers and deltas. It argues that due to long disciplinary divisions (Tsing 2014), river and delta studies have only focused on human perspectives. Social

science studies have focused on ways rivers and deltas have shaped human imagination, including culture, societies, and economics. While natural science has broadly focused on "natural processes" that shape the river and delta.

Chapter 2, "Returning to the roots: The Indus Delta becoming," is a treaty into the "deep time" (Irvine 2020) of geological processes and forces that created the Indus River and Delta. It brings to the fore riverine and deltaic processes at work in shaping the delta's physicality, that is, its land-water configuration. The chapter draws on geological and fluvial geomorphology literature on the Indus River and the Delta. The archival research provided a rare window into the history of the Indus River and the Delta before any modern dam was constructed. The first dam on the Indus River was constructed in 1932 by the British colonial administration (Haines 2013); however, the colonial archives provide insight into the river and delta of the 1800s and early 1900s.

In this research, colonial archives serve as a crucial resource for understanding how the British administration conceptualized and engaged with the Indus River and the Delta, a theme that runs through chapters two and three. The British colonial government consistently characterized the Indus River as unpredictable, erratic, and difficult to control, often referring to it as an "awkward river." These descriptions framed the river as an obstacle to imperial governance and economic expansion, justifying large-scale infrastructural projects such as irrigation canals, barrages, and dams to discipline and regulate its flows.

However, a counter-reading of these archives reveals an overlooked perspective—the river and delta's voice. While the colonial archive primarily documents human interventions in the landscape, it inadvertently captures the agency of the river through

detailed accounts of its shifting channels, sediment deposition, and flood patterns. In its natural state, the Indus River was not a passive entity to be mastered but an active, dynamic force that continuously reshaped the deltaic landscape and, in turn, human and other-than-human relations. It created new water channels while choking others with sediment, frustrating colonial engineers but reflecting the river's inherent agency. The once-unpredictable, sediment-laden river that sustained the delta's wetlands and fisheries became a controlled, regulated waterway with significantly reduced sediment transport. Recognizing the role of riverine and deltaic processes as active historical participants challenges anthropocentric narratives that frame them solely as a resource to be managed.

Moreover, this chapter contributes to delta studies by foregrounding the complex processes of sediment and water flows and emphasizing sea tides and other material processes in re-shaping delta physicality and, conversely, human and other-than-human beings' relations. Beyond sediment and water, deltaic environments are shaped by various interacting material processes, including sea tides, monsoonal floods, tectonic activity, and anthropogenic interventions. For instance, the Arabian Sea's tidal flows push saline water upstream, influencing sediment deposition patterns and freshwater availability. This tidal movement is further exacerbated by reduced river flows due to upstream infrastructures, leading to increasing salinity intrusion, which alters agricultural productivity, fish populations, and mangrove ecosystems. These processes transform the delta's physicality and redefine human and other-than-human relationships within these spaces.

Chapter 3, "The will to improve: Governance image of thought and the Indus Delta," answers the central question of how governance organizations define and engage

with the degradation of the delta when they will “improve” it. The chapter argues that the improvement schemes are informed by how governance organizations construct the “degradation” of the delta. Following Tania Murray Li’s “critical stance - to prize open expert knowledge and expose its limits” (Li 2007, 02), my interest was in the discursive practices, discourses, and mechanisms by which organizations “find” culprit(s) of the degradation of the delta, and the ways this informs the rationale of various improvement schemes (Ferguson 1994). The chapter traces the improvement schemes from the British colonial period to the present and, in so doing, describes what and who is included and excluded in the processes of the so-called improvement of the delta. Finally, the chapter shows how the deltaic processes and its multispecies world conform to and/or evade the governance organizations' improvement schemes, sometimes helping them and sometimes frustrating their plans.

Theoretically, this chapter contributes to political ecology literature. A political ecology informed by multispecies ethnography and new materialism can address the sustained critique of political ecology that it is “politics without ecology” (Bassett and Zimmerer 2004, 103; see also Vayda and Walters 1999) and ignores the other-than-human beings’ agentive character in shaping society, politics, and even capitalism (Srinivasan and Kasturirangan 2016). By foregrounding other-than-human beings, materials, and planetary processes as protagonists in the making and unmaking of planet Earth, and in this case, the Indus Delta, a more-than-human political ecology will help break free from habitual “development thinking” which requires viewing the delta differently, a delta that is neither a “wasteland” nor reduced to a “resource.” It allows us to “think like a delta” (Knox 2020), a delta that is dynamic, lively, and unruly, where deltaic processes and

human and other-than-human practices and relations are entwined in the making and unmaking of the delta.

Chapter 4, "Other-than-human affective relationalities: Camels, mangroves, and saltwater intrusion in the Indus Delta of Pakistan," takes on a journey with the Indus Delta camels and their intimate historical relationality with the *Tamer* (mangroves). Ethnographically, following camels and mangroves via Jats – the camel herder community, I propose a conservation approach focusing on intimate relationality among species. Drawing inspiration from Kohn (2022) and de la Bellasaca (2017), speculative conservation does not seek to establish a definitive model or description but rather explores alternative approaches to conservation informed by ethnography and nonwestern knowledge. This approach aims to broaden conservation practices and envision a more inclusive and sustainable future amidst the ongoing biodiversity loss and the sixth mass extinction (DePuy et al. 2021; Kolbert 2014).

This chapter contributes to the broader literature on multispecies conservation and argues that conservation practices focus on "relations" or "multispecies relations" rather than species or ecosystems. Adopting a speculative approach informed by De la Bellasaca's notion of speculative conservation, the proposal to reorient conservation practices towards preserving multi-species relations underscores a departure from conventional conservation paradigms. This speculative conservation envisions a conservation practice that transcends the politics of concepts and embraces a broader understanding of relations that extend beyond the human realm.

Chapter Five summarizes the major argument of the complete dissertation, discusses the positionality and reflexivity, and offers a major contribution to the dissertation and chapters.

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CHAPTER 2

Returning to the Roots: The Indus Delta Becoming

In truth, there are only inhumanities; humans are made exclusively of inhumanities, but very different ones, of very different natures and speeds.

(Gilles Deleuze and Felix Guattari, *A Thousand Plateaus)*

Introduction

Sitting on the damp earth near the water's edge one evening, an elder fisher carefully traced lines on a piece of paper, his fingers rough and calloused from years of navigating the river's tides. The fading light of dusk cast long shadows over his weathered face as he explained how the Indus River had shaped the land for generations in its unpredictable yet purposeful course. With each line he drew, he mapped the river's physical flow and the deep connections between the water, the land, and the people who depended on it. "The river flows through these landscapes as blood flows through our veins. . . It is the life of the delta." His words echoed the sentiments of countless fishers and camel herders who had long understood the Indus River not as a passive body of water but as a living force, constantly shaping and reshaping the delta. For centuries, the delta has been sculpted by the river's changing moods—its gentle currents and destructive floods, slow sediment deposits, and sudden shifts in course. These rhythms dictate the movement of people and animals, determine the fertility of the land, and define the very nature of existence in this fragile, ever-changing landscape. However, in recent decades, large-scale human interventions have disrupted the river's ability to breathe life into the delta, from dams and barrages to industrial expansion.

Alongside the dynamic flows of the river, the relentless movement of sea tides plays an equally crucial role in shaping the delta. As the Indus River carries vast amounts of sediment downstream, the tides work ceaselessly to redistribute these deposits, sculpting the intricate and ever-shifting landscapes of the delta. This interplay between riverine and tidal forces gives the delta its unique character—an environment constantly in flux, where land and water are in an ongoing dialogue of creation and erosion. The sea's rhythms determine the fate of these sediments, sometimes pushing them inland to form new landforms and erode the coastline, reclaiming what the river has built. This tidal action, combined with seasonal flooding and monsoonal variations, ensures that the delta is never static. Instead, it remains a living, breathing entity where human and non-human actors must constantly adapt to the shifting terrain.

Today, the Indus Delta is the work of inhuman forces and processes as much as it is a product of human imagination. In this chapter, I focus on inhuman riverine and deltaic processes as these processes shape the delta and influence human and other-than-human practices and relations. My inquiry begins with the inhuman processes of riverine flows, tides, monsoons, and shifting geological formations. Following McLean (2009), I challenge the tendency to view landscapes as mere backdrops to human history. Here, the Indus Delta is not just a setting but a dynamic participant, shaped by and shaped human and nonhuman life alike. To understand its transformations, we must look beyond human narratives alone and listen to the voices of the river, the shifting sands, and the encroaching tides.

The stories I tell of the Indus Delta are nonscalar. Such stories allow "encounters across differences" (Tsing 2012, 510) to emerge. This is about paying attention to how

"historical contingency, unexpected conjuncture, and the ways that contact across differences" (Tsing 2012, 510) produce the Indus Delta. Nonscalar stories do not leave local history and politics untapped. Rather, they seek to engage with them in different ways. Scalar stories emphasize division – in the case of this research, the division of upstream/downstream – fixation is entrenched in hydrological reports, federal policy discourse, and national media, which construct water-related conflicts in hierarchical and linear terms: who controls the water, who is entitled to receive how much, and who suffers deprivation. This can flatten the complexity of the Indus Basin. By constructing categories such as "downstream," the state effectively renders diverse social and ecological life-worlds homogenous, erasing the heterogeneity of human and more-than-human relations that characterize places like the Indus River and Delta. As Escobar (2016) points out, what is rendered "non-existent" or "non-credible" by dominant ontologies is often actively produced as such. In the case of the Delta, this scalar logic silences the vibrant, situated, and relational lifeworlds of its communities – human and nonhuman, lands, animals, and waters – dismissing them as mere background to technocratic or developmental narratives.

Nonscalar stories, on the other hand, allow us to acknowledge the heterogeneity of places, beings and relations, which often do not fit into scalar premises (de la Cadena 2015; Tsing 2012, 2005). For example, Pakistan's hydrological and irrigation history do not only impact humans and biodiversity, but also nonhuman riverine and geological processes which are entangled with human and nonhuman practices. The Indus is not a passive conduit; it is a force, a rhythm, a relation. The fish, mangroves, tides, and sediments are not inert matter—they act, respond, resist. A state history that ignores these

agents remains incomplete. By situating them at the center, nonscalar narratives allow us to write ecological and political histories that account for more-than-human agency. This does not mean non-scalar projects are better than scalar ones (Tsing 2012); rather, the former tell the stories which are otherwise ignored in the latter.

Such storytelling practices take inspiration from Deleuze and Guattari's philosophy of becoming, which involves heterogeneous assemblages between entities. In their example of a wasp and orchid, following Remy Chauvin's phrase of "*the aparallel evolution,*" they discern the assemblages of "two beings that have absolutely nothing to do with each other" (Deleuze and Guattari 1988, 10). In this chapter, I explore and write about the heterogeneous assemblages of entities and processes that otherwise have nothing to do with each other yet whose encounters create the Indus Delta. In discerning heterogeneous assemblages, one must be curious about "open-ended gatherings" (Tsing 2015, 23) without assuming any relationship between beings and entities. What is the relationship between European and Asian tectonic plates in life in the Indus Delta? How do earthquakes creatively produce the delta?

Geologists and deltaic geomorphologists define the Indus River and the Delta as a "highly dynamic [system] reflecting the impacts of monsoonal-driven floods, and cyclone-induced storm surges, earthquakes ranging up to Ms=7.8, and inundations from tsunamis" (Syvitski 2013, 24). Local ontology also accentuates a dynamic delta, with human lives revolving around experiencing, understanding, and navigating this dynamism. This chapter foregrounds this *dynamism* and invites us to imagine how various inhuman forces and processes creatively produce the delta where humans and other-than-human beings can realize their lives and relations.

Literature Review

This chapter employs new materialism and geological anthropology to examine how inhuman material processes continuously shape the delta's physicality, influencing human and other-than-human relationships. Traditional academic boundaries such as human versus nonhuman and living versus nonliving—have long framed inquiry (Raffles 2012; Tsing 2014; Povinelli 2016; Yusoff 2018), often limiting anthropologists to human-centered narratives (Tsing 2014). While recent anthropological scholars have engaged with nonhuman beings (Kirksey and Helmerich 2010; Odgen et al. 2016), inhuman forces remain underexplored. Inhuman processes and forces not only form landscapes in the backdrop of human experiences (Basso 1996; Massey 2005); they actively shape experiences, relations, and the very conditions of existence.

This chapter engages with Anna Tsing's (2014) assertion that sociality is not limited to humans but extends to nonhumans, including rocks and rivers. It examines inhuman socialities by exploring the geological processes that shape deltas and influence human and other-than-human relations. Moreover, writing culture has always been poetic and political (Clifford and Marcus 1986), yet as Raffles (2012) provocatively asks, "What is writing culture when the object is neither human nor animal nor multispecies . . . yet is entirely inseparable from life itself, is in fact, life itself?" (Raffles 2012, 527). Incorporating geological processes into anthropological inquiry challenges foundational disciplinary assumptions and compels us to reconsider key concepts. Clark and Gunaratnam (2016) ask similar questions: "What happens to our own disciplinary assumptions and investments when social inquiry engages fully with a mobile, forceful, and dynamic earth? What becomes of the social, the cultural, the historical, and the

political categories … if we open social thought to climatic, geologic, or geophysical processes in a deep and sustained way?" (Clark and Gunaratnam 2016, 148). By engaging with these provocations, this chapter expands the scope of social inquiry to include the dynamic forces of the earth itself.

This chapter responds to these provocations from an ethnographic point of view by interrogating the inhuman geological riverine and deltaic processes in the formation and transformation of the Indus Delta and human and other-than-human relations. This research contributes to the growing literature on geosociality that explores the inherent intertwinement of geological events and social practices. If the sociality of living beings is "made in entangling relations with significant others" (Tsing 2014, 27), then inhuman sociality, I argue, emerges from its powers to transform entangled relations of living beings[6]. While this chapter focuses on inhuman sociality, it should not be inferred that I see the living and inhuman socialities as separate. Rather, as I show below, geo and bio-socialities intertwine in the Indus Delta.

To foreground the inhuman sociality, this research focuses on delta studies, which have been dominated by human-centered narratives of changing waterways and landscapes (Iqbal 2010; Jalais 2010; Biggs 2012; Krause 2017; Bhattacharya 2018; Muhelmann 2013; Johnson 2020; Richardson 2021). While these studies provide critical insights into human engagements with shifting rivers and deltas, they often overlook the geological forces that make river flows and delta formations possible in the first place. The creative destructive powers of deltaic geological forces and processes do not merely shape landscapes—they create the conditions for "life." In other words, the riverine and

[6] I will work on the more nuanced definition of inhuman sociality in future.

deltaic processes and forces are as geological as social, blurring boundaries between human and geological sociality. This chapter emphasizes the production, movement, and transformation of geological forces, focusing on the shifting and moving tectonic plates, earthquakes, water, sediments, sea tides, and infrastructures, humans and other-than-human beings to illuminate the entangled, co-constitutive relationships between the geological and the social in the Indus Delta.

Anthropology has long engaged with materiality through deterministic frameworks of cultural ecology. Julian Steward (1955) argues that the material environment is one of the major contributors to shaping culture, and Leslie White (1959) explores the role of energy in the evolution of cultures. Later, Arjun Appadurai's (1988) work on the "social life of things" highlighted how materials define people rather than people defining materials. The silk trade, for instance, did not merely transport silk—it shaped the identities of those involved. As Miller (2005, 38) puts it, "things people make, make people," and cultures are "created and lived through objects" (Woodward 2007, 4). Also, Alfred Gell (1998) viewed art objects as active agents shaping human intention.

With the ontological turn in social sciences and humanities, there has been renewed interest in materials, objects, artifacts, and non-living entities across different fields. From neo-materialism (Braidotti 2013) and new materialism (Coole and Frost 2010) to Object-Oriented Ontology (Harman 2018), vital materialism (Bennett 2010), agential realism (Barad 2003, 2007), Object-Oriented Feminism (Behar 2016), and Actor-Network Theory (Latour 2005), and geosocial (Yuosuf 2018) or political geology (Bobbette and Donovan 2018). These perspectives reject rigid European binaries such as human-nonhuman, living-nonliving, life-nonlife, and male-female, emphasizing a world

that is “plural, open, complex, and contingent” (Coole and Frost 2010). Instead of privileging human representationalism, they assert that all entities—living and nonliving—have the capacity to affect and be affected by other entities (Deleuze and Guattari 1986). One of the key arguments of the ontological turn, especially in anthropology, is to be wary of the ontological foundations of the concepts we use to make sense of the concepts and lifeways of Indigenous people. If, for Indigenous people, a thing or any material is a person and as social as humans are, then it is important to interrogate our concepts of a thing and sociality and to imagine what a thing can be (Henare et al. 2007; Holbraad 2012; Santos-Granero 2009; Viveiros de Castro 2015). Following these arguments, ethnographic works with Indigenous peoples have foregrounded the ways mountains (de la Cadena 2015), rocks (Povinelli 1995, 2016), glaciers (Cruikshank 2005), volcanoes (Bobbette 2023), and rivers (Velasquez-Runk 2009; Raffles 2002; Strang 2014) can be social, and refusing to surrender to the Western dualism of living and nonliving.

Building on these theoretical frameworks, I engage with scholarships that examine inhuman processes, forces, events, and their inherent sociality. Alfred North Whitehead (1978), in his process philosophy, challenges “scientific materialism,” which perceives matter as “senseless, valueless, purposeless,” operating mechanistically under externally imposed routines (Whitehead 1948 [1925], 18). Instead, he conceptualizes the world as an ongoing event where materials and beings interact, generating multiple possibilities for existence (Whitehead 1948 [1925]). Barad (2007) extends this notion, contending that “existence is not an individual affair” and that individuals do not precede their interactions but rather emerge through entangled intra-relations (Barad 2007, ix).

She further asserts that "the primary ontological units are not 'things' but phenomena—dynamic topological reconfiguring/entanglements/relationalities/(re)articulations of the world… The agency is not an attribute but the ongoing reconfiguring of the world" (Barad 2007, 141).

These philosophical perspectives and their contemporary adaptations facilitate an exploration of Earth's "multiple forces, processes, and properties" as dynamic agencies that continuously transform (Clark and Gunaratnam 2016, 16; Connolly 2017; Khan 2019). Elizabeth Grosz (2008) emphasizes that geological forces are preindividual and impersonal, forming the fundamental conditions for life. For instance, as I will illustrate, tectonic shifts triggered ancient earthquakes, whose intensities and movements reshaped the planet Earth. Other forces influenced these tectonic shifts, perpetuating an ongoing transformation cycle. The creative-destructive capacities of these geological processes led to the formation of the Indus River and its delta, enabling the emergence of life. These geological becomings constitute inhuman socialities, which, through their entanglement with human and other-than-human relations, actively shape and are, in turn, shaped by them.

Various ethnographic works have highlighted human "susceptibility" and the becoming of living sociality with geological planetary relations. Bobbette (2023) shows how the volcanoes have shaped Javanese society. "Societies in Java were traditionally ordered on the principle that geology was social, that social history was geological history, and that volcanoes were societies (Bobbette 2023, x). Oguz (2023) shows the entanglement of geology in oil exploration and warfare in the Kurdish part of Turkey. Clark (2007, 2011) explains how Lisbon's contemporary geography and society emerged

from historical earthquakes and Tsunamis. Khan (2019) explores the 1940s earthquakes that shaped the contemporary Bengal River and the delta, thus the society. These scholars argue that people's existence is "constituted by so many mineralogical, geological, and planetary relations, to the point that people cannot be who they are without them" (Whittington and Oguz, 2023, 153; Oguz 2020).

To further explore geosociality, scholars have called for "geological anthropology" as a separate field of study to explore "the role of earth sciences, geological formations, and the subterranean in the constitutions of social worlds and operations of power[7]" (Oguz 2020). Kneas (2020), for example, argues how the notion of depth in the geological survey of the Andes in Ecuador becomes a process through which subsoil territory is imagined and endowed with political and economic significance. Ballestero (2020) similarly explores plume pollution in underground aquifers as a dynamic system that challenges any fixity. Vaughen (2020) demonstrates how coastal erosion complicates the practices of engineers who want to "hold the [coastal] line" fixed. Tironi (2020) investigates the history of rocks in Salar around which the Indigenous community of Atacameno lives. She explores the "onto-epistemic short circuit at play" when the geologist explores the lithium in the rocks, and local people walk to reconnect the relationality with their ancestors and gods that inhabit the Salar that has been disturbed by lithium mining. These works focus on the subterranean geological and planetary processes and forces not as responders to human imaginations but as active participants in shaping the world around us.

[7] https://culanth.org/fieldsights/introduction-geological-anthropology as accessed on January 14, 2025

For example, while writing about the so-called floods of the Indus River, I draw on critical literature that illustrates how the notion of "flood" as a disaster is European colonial "river literacy" (da Cunha 2019) that gave birth to the colonial flood management which sought to protect lands based on Eurocentric notions of property (Wells 2011) to create and secure the loyalty of landlords (D'Souza 2006) to increase production and commercialize the newly created lands (Saikia 2015; Singh 2011). Two kinds of literature on rivers and deltas are abundant. First are the water-biased studies, which critically examine the role of water in shaping human imagination, society, and culture (Wittfogel 1957; Raffles 2002; Alley 2002; Baviskar 2013; Wagner et al. 2018; Iqbal 2010; Biggs 2012; Taylor 2014; Bhattacharya 2018; D'Souza 2006). Recently, a second kind of literature has focused on sediments (Micheaux et al. 2018; Carse and Lewis 2017; Cortesi 2018; Parrinello et al. 2021). However, their focus remains on the anthropogenic activity that disturbs the sediment supply and its fallout on the delta and its people (e.g., Parrinello et al. 2021).

However, below, I debunk the myth of "floods" in the context of deltas. I also describe the often-overlooked geomorphological transformations of the flow regime – of water and sediment produced in rivers and deltas. These physical changes—such as shifts in river channels, sediment redistribution, and formation of creeks, dunes, estuaries, and others play a critical role in shaping the delta physically and influence human and non-human lives and relationships. For instance, sediment deposition during so-called floods can create fertile agricultural lands, while erosion may displace communities and disrupt ecosystems. However, as I show below, river erosion is never considered a bad phenomenon by the people of the delta, which initially baffled me because we are taught

to see erosion as bad. This was also echoed by Anna Tsing (2015, 151), as she was startled at hearing “erosion is good” in pine production.

Methodology

Considering the Indus Delta as a research subject (de la Cadena 2017; Wagner et al. 2018), I set out to "trace" (Haraway) its presence across a range of sources to examine inhuman geological riverine and marine processes and forces that continuously shape the delta, influencing human and other-than-human practices and relations. I integrate local narratives collected over 18 months of ethnographic fieldwork, published scholarships on the geology and fluvial geomorphology of the Indus River and Delta, and the British colonial-era memoirs, Gazetteers, and official reports documenting the river’s historical transformations.

At the beginning of my fieldwork, I realized how important deltaic processes, such as daily sea tides, river flows, and others, are and how they shape local people’s daily lives. Going fishing, it is almost impossible to take the same route back to the village. Tides recede, and water becomes soil. While talking with the local people, my curiosity opened up stories of how daily tides, seasons, monsoons, typhoons, and earthquakes shape the physicality of the delta and, in turn, human and other-than-human practices and relations. In addition to participation observation, I interviewed local people (n=34) to explore their knowledge and experiences about these riverine and deltaic processes and forces. Human and other-than-human beings’ “susceptibility to the [delta’s] eventfulness” (Clark 2011, xiv; see also Connolly 2017) became clear, and a window into how the “multiple forces, processes, and properties” of the river and deltaic world are a

pervasive force that shapes biotic life in the delta (Clark and Gunaratnam 2016, 16; Connolly 2017; Khan 2019).

I also interviewed people at the Pakistan Meteorology Department in Karachi (n=05) who monitor the weather patterns in the delta, including monsoon rains, typhoons, floods, famine, and earthquakes. I also interviewed engineers at the Sindh Irrigation Department (n=05) who manage Indus River waters for irrigation purposes. These interviews provided a necessary understanding of how the Indus River is managed today amidst the riverine infrastructures and its impact on the Indus Delta. I also interviewed hydrologists and people who have knowledge about Indus River flows (n=08).

Finally, travelogues, memoirs, and official documents of the British colonial period provided a rare glimpse into the Indus River and Delta before any modern infrastructures were built on it. I did one month of archival research at the British Library in London and one month at the Sindh Archives in Karachi. Sindh was colonized in 1843 by the British; however, as early as 1700, British officers were visiting the province. Their usual purpose was military, and in so doing, during their visits, they wrote extensively detailed descriptions of the Indus River and Delta, the only route available from India to Sindh. For example, the young British officer Alexander Burnes was tasked to deliver six British horses to Raja Ranjit Singh of Punjab. The only possible way to deliver those horses was through the Indus Delta and River. To seek permission from the Talpurs, the then-rulers of Sindh, he visited and stayed in the delta for months. During his stay in the delta, he wrote extensively about the people, their customs, and the military power of the Talpurs. However, he also wrote about deltaic geography, geomorphology, and the Indus River. One such memoir, written in 1827, just eight years after the great

earthquake of 1819, provides a rare first-hand account of the earthquake and its impact on the geography of the delta. These travelogues, memoirs, official documents, and ethnographic work are about writing "historically with ethnography and ethnographically with history to offer a particular genealogy of the co-constitution of place-making, nature-making, and region-making" (Raffles 2005, 375) in the Indus Delta.

Delta as Becoming: The Material Life of River Flows

The Indus Delta, a terrain of ceaseless becoming, confounded British explorers who sought to impose cartographic fixity upon a space that refused to be contained. In 1826, Alexander Burnes[8], a young British Army officer, encountered this dynamic multiplicity firsthand. The river, a force of deterritorialization, perpetually reconfigured itself, shifting its courses, generating new branches, and erasing others. Burnes articulated his astonishment, stating, *"The River Indus is so constantly subject to alteration, in particular towards the sea, that it must ever be fruitless to attempt the identification of any of its branches* (Burness 1826, 73)*."* For the British, accustomed to the more stable European rivers (Weils 2006), the Indus Delta presented a legibility problem. They encountered a geography that refused stability, undermining their efforts to map, measure, and discipline its flows. The cartographic gaze of the empire sought to render this landscape legible, but the Indus, in its becoming, remained elusive, defying representation (Weils 2006). This challenge was not merely technical but ontological—the Indus Delta was an assemblage of flows and intensities that did not conform to the logic of colonial spatiality.

[8] The British Library archival reference # IOR/MSS/EUR/1328

This instability, far from being an isolated phenomenon, continued to baffle British explorers and administrators. In 1831, Lieutenant T. G. Carless of the Indian Navy confronted the delta's transformations and was struck by the velocity of its reconfigurations. Reflecting on Burnes' observations, he wrote:

> *Some idea may be formed of the rapidity with which the branches of the Indus fill up when I mention that in 1831, Captain Burnes passed through it on his way to Hyderabad and that when I visited it four years after, the greater part of its bed was level with the plain. Hitherto, it has been considered a matter of doubt whether large vessels ever navigated this celebrated river or any of its branches"* (Carless 1838, 471).

Carless' account attests to the delta's refusal of historical continuity; the river's movements do not simply alter the landscape but produce a form of temporal rupture. The past is eroded, reconstituted, and folded into new formations, making any attempt at stabilization futile. This same movement is inscribed in the oral histories of deltaic communities, whose stories register a deep attune to the fluidity of space. Standing atop a protective embankment, a local fisherman remarked, *"Do you know this is the third Keti Bunder?"* His hand traced an invisible lineage of lost towns swallowed by the sea, shifting with the capricious flow of the Indus. He pointed westward: *"The previous Keti Bunder was in that direction."* This lived experience of becoming a river—where settlements are transient, and the very ground beneath one's feet is an ephemeral surface—echoes the 1876 colonial *Sindh Gazetteer*, which described this instability:

> *The capricious nature of the current in other parts is remarkable, and this shows itself in the frequent alterations of its navigable channels. A total change occurs at times in the direction of its entire body of water, as well as in its great partial velocity of current. Thus, the town of Ghorabari in 1845 was seated on the Hajamro and was the only place of commerce at that time in the delta. In 1848—only three years afterward—the river capriciously left it, and another spot, Keti, had to be selected; this too was overflowed some time afterward, rendering it necessary to build a second Keti, a short distance from the first"* (Sindh Gazetteer 1876, 269).

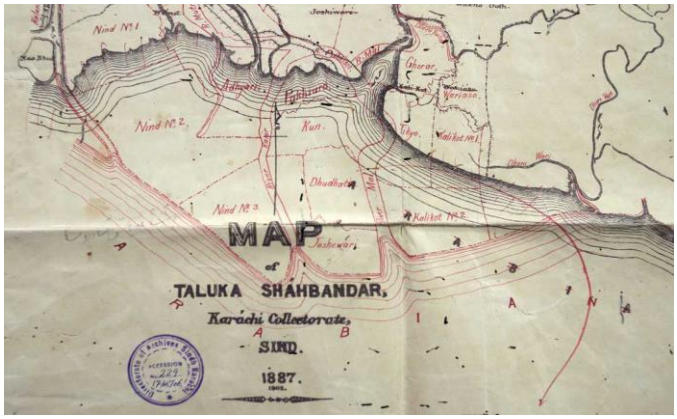
The repetition of destruction and relocation of towns emerging and dissolving articulates a geography of impermanence. However, for local inhabitants, this instability was not a crisis but an elemental condition of existence. Unlike the British, who perceived the river's mutability as an obstacle to control and governance, the delta's inhabitants lived within its rhythm, embracing its multiplicity. The river's movement, rather than an aberration, was the fundamental principle of the deltaic world (Bhattacharya 2018).

The delta's becoming is further visualized through colonial maps (Maps 1 and 2). British colonial cartographic attempts to fix what was inherently unfixable. Each map, upon completion, was already outdated; the river had moved, the channels had shifted, and the delta had reshaped itself. This frustration permeates the colonial archive, revealing the impossibility of capturing the delta's movements through static representation. Maps were not records of geographical reality but snapshots of fleeting configurations, moments of an ongoing process that could never be arrested (Bhattacharya 2018; da Cunha 2019).

The Indus Delta is always *becoming*, the river's course is never final, and its branches are never permanent; land and settlements emerge and disappear. The delta is an event rather than an object—a site of perpetual emergence where the interplay of forces resists any totalizing claim to fixity. The Indus Delta, then, is a geography of becoming, an unfolding of forces where the past is never fixed, the landscape is never settled, and human and non-human actors are entangled in a ceaseless negotiation with the river's

movements. It is a space that challenges the notion of stability, refusing to be disciplined into the grids of empire, flowing beyond the boundaries of colonial reason.

Map 1- The Indus River map was later edited due to its shifting course[9] (collected by the author from Sindh Archives, Karachi)



Map 2. The Indus Delta map was later edited due to its shifting course (collected by the author from Sindh Archives, Karachi)

Rivering the Delta: Flows, Sediments, and Transformations

Initially, I intended to write separate sections on water and sediments, but I soon realized they are inseparable. The river carries sediments, and sediments shape the river's form. For instance, the Indus meanders through Sindh due to sediment erosion on outer curves and deposition on inner curves (Charlton 2010). This ongoing interplay continuously reshapes the river's morphological structures, influencing human and other-than-human relations, which I explore in this section.

[9] Accession # 229 – 17/k/06 – Sindh Archives Karachi.

During a mangrove restoration workshop in the Indus Delta, a conversation between a young man and an elder reshaped my understanding of riverine floods. When the young man called *boodh* (flood) a great problem, the elder, around 80, firmly disagreed: *I have never heard the word boodh* (flood) *in the delta. We always pray that the river flows year-round and be as high as possible.* His protest struck out the notion of floods as a problem, challenging me to rethink the river, its flows, and the relationships it sustains. If the concept of "flood" is unfamiliar in their experience, how do I avoid imposing an external narrative? Even asking, *"What is a flood?"* risks shaping their response in ways that obscure their lived realities.

This dilemma reminded me of Jean-Marie Gustave Le Clézio's novel *The Interrogation*, where the protagonist, Adam Pollo, struggles with words he does not want to say. Le Clézio resolves this by striking through them: ~~*"That is to say, while I was walking around the town, keep a lookout for things that might be useful later on …"*~~ (Le Clézio 2004[1967], 144). Similarly, the elder's rejection of *boodh* as a flood compelled me to strike through the term in my own inquiries. Instead of using the word, I engaged my fishers in discussions about officially declared "floods" without naming them as such. By removing the dominant flood narrative, I allowed other stories of the river to emerge, stories that would have otherwise been lost.

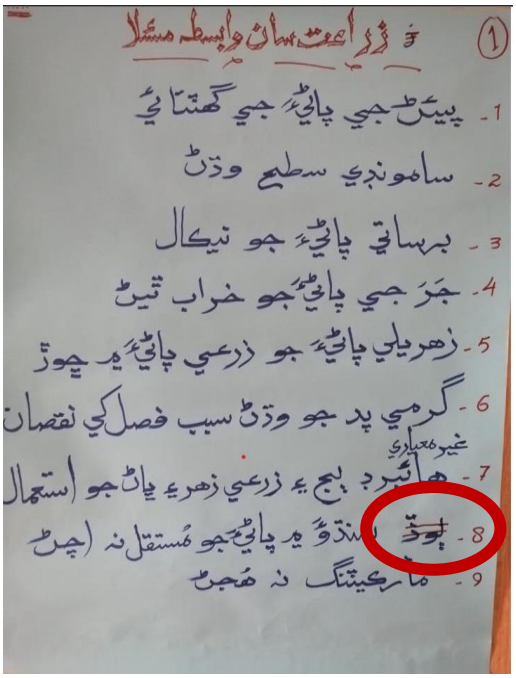


Figure 1. List of problems agriculturalists face in the delta. At number 8, a young man listed the *boodh* (flood), which was later crossed out (*Source:* Author)

The flood as disaster, deviation, and excess is not an inherent property of the river but a colonial inscription, a coding of flows into a logic of crisis and control. Maneck B. Pithawala, writing from within the epistemic machinery of British hydrology, sought to render the Indus legible through the language of scientific rationality. He named the Indus River "awkward," a body unwilling to submit to the discipline of engineering, its movements unruly, its shifts unpredictable. Yet what Pithawala framed as the disorder was simply the river's process of becoming, its meandering, its avulsions, its perpetual differentiation. The river does not obey the logic of fixity. Pithawala's (1943) proposes a triple theory of Sindh floods: the westering tendency of the river, the rise of bed level due to silting, and the consequent corrasion, branching off of the stream, and avulsion or short circuit (Pithawala 1943, 66).

Geomorphologists argue that instability is inherent in meandering rivers due to their natural process of erosion and deposition. As Hooke (2007) explains, rivers erode one bank while depositing sediments on the other, leading to cycles of increasing sinuosity followed by abrupt cut-offs (239). This lateral river migration posed significant challenges for British engineers, who sought to confine its flow by constructing protective bunds on both sides. However, annual floods caused the river to shift westward, raising the riverbed and forcing the engineers to build successive layers of bunds and loops (Pithawala 1943, 65). Pithawala (1943) proposed rigorous river training to prevent avulsion, advocating for reservoirs to absorb overflow above the Bukkur Gorge, revetments made of boulders, strategically placed groins, silt separators, and improved loop renewal. These historical and contemporary attempts to control the Indus reveal an ongoing struggle between human intervention and the river's inherent dynamism.

The colonial intervention was not merely hydraulic; it was ontological. It sought to transform a river in flux into an object of governance, a body to be trained, disciplined, and made predictable. But rivers do not obey the logic of grids. The delta, floodplain, and braided channels are not stable formations but assemblages in perpetual motion, composed through the sedimentary dance of erosion and deposition. The Indus does not merely flow; it constructs and deconstructs, deterritorializing land into water, water into land, in an ongoing negotiation of forces.

Local people had a more nuanced experience and understanding of the rivers in the delta. The river flow is not a problem to be solved but a force to be lived with. Their lexicon of water does not conform to the colonial distinction between flood and drought,

stability and disaster. Instead, they attune themselves to the shifting materialities of flow, where sediment is not a residue but a generative substance, an agent of becoming. Unlike the flood engineers, who saw erosion as destruction, they understand it as a transformation process; when a bank erodes, another rises elsewhere, and the river inscribes new possibilities upon the land. This is not merely a pragmatic adaptation but an ontological orientation, an openness to the river's continuous mutations.

I encountered this "memory of the river" (Lyons 2018) inscribed upon the land during my fieldwork. In one village, an elder gestured to the earth beneath us: "Where you are standing now, that was once a flowing river." In another village, people pointed to the back of their homes where mangroves now grew, mapping the river's past trajectories in the backyard of their homes. Each village I visited in the delta carries the memories of the river's movements and refusal to be fixed in place. "This village didn't even exist here before," one man told me. "It was further east. When the river shifted, it eroded our old home but created this land for us." These stories were not merely nostalgia but an ongoing negotiation with a river that continually makes and remakes the deltaic world. Thus, the river is not a background to human experiences but an actor, a co-constitute force shaping landscapes and relations. It is not an object to be managed but an assemblage of sediments, water, geological forces, and human history. To live with the Indus is to live with movement, uncertainty, and the knowledge that land is not a given but an emergent formation, always in the process of becoming.

The stakes of these flows became apparent as I drove past the Kotri Barrage, where the floodgates had been opened, allowing the river to surge toward the delta. I called one of my long-term hosts and now a friend to share the news, expecting relief,

perhaps excitement. He showed excitement and asked me to repeat what I said so that his whole family could listen as he turned on his phone speaker. There was happiness in his voice. But his response surprised me. “What is the color of the water?” he asked. Puzzled, I hesitated. “It looks brown,” I replied, uncertain of the significance of my observation. Later, when I met him and other fisherfolk in the delta, I asked why this question mattered. They explained that water reaching the delta is good, but not all water carries life equally. “It is great when the water is white,” he told me. White or brown water, not clear water, is rich with silt. It is the true lifeblood of the delta. It was not simply liquid but a material assemblage, an entanglement of sediments, water, and nutrients in the river's flow. “The sediments push the sea and reclaim the land,” they told me.

The Indus River had the highest capacity to transport sediments towards the delta. The river could transport more than 100 million acre-feet (MAF) of water carrying more than 500 Mt/year of sediments toward the delta in pre-dam conditions (Syvitski et al. 2013). Due to these riverine flows in 1861, the Indus River had 17 mouths (creeks) in the delta that would discharge the water into the sea. The following hydrological data shows how the water flow towards the delta has been reduced over time.

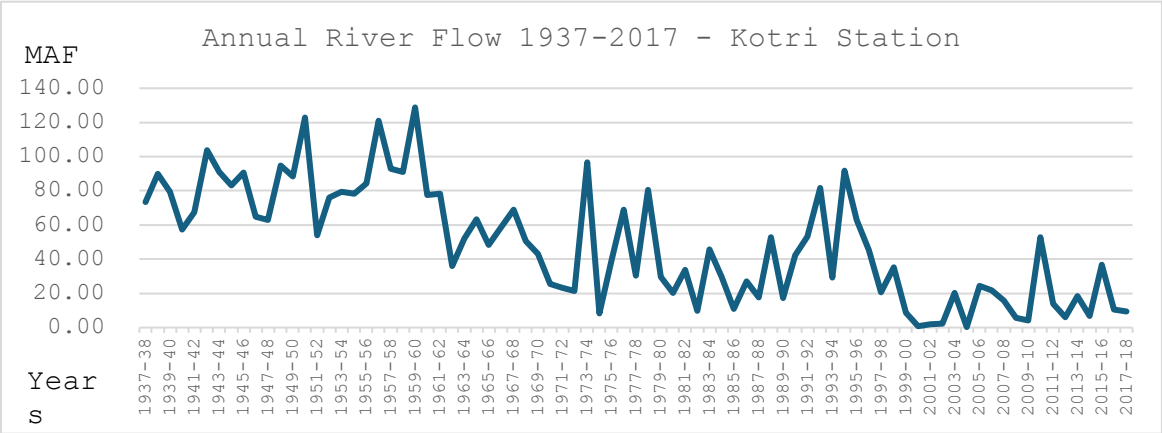


Figure 2. Indus River flows at Kotri Station, 1927-2018 (Data collected by the author from Indus Water Commission, Pakistan)

Figure 2 shows the Indus River flow of the last 80 years. The graph shows the river flows have been reduced over time. The Ghulam Muhammad Barrage, commonly called Kotri Barrage, is the last barrage on the Indus River before the delta was constructed in 1956. The graph clearly shows a sharp decline in the water flow. The first dam on the river was constructed in 1932, but between the 1950s and 1970s, three gigantic hydroelectric dams, numerous barrages, and thousands of kilometers of canals were constructed on the Indus River[10].

The reduced river flow due to upstream infrastructures interplay with the geomorphological golden rule on the riverine deltas given by G.K. Gilbert in 1884, that is, "the capacity and competence of a stream for the transportation of detritus are increased and diminished by the increase and diminution of the velocity [of the river]" (cited in Wright 1985, 09). The reduced river flow diminishes the river's velocity to

[10] In Chapter 2, I thoroughly discuss, how the altered river flow has transformed the Indus Delta, its impact on human and other-than-human beings, and the ways governance organizations define and manage the transformed delta using political ecology framework.

transport the sediments to her mouth. Thus, asking about the water's color by local people means asking what the river brings and what it makes possible amid uncertain conditions the river and communities – human and otherwise are facing. It is to recognize that the river is not just an entity but an assemblage of forces, and these forces shape and reshape life and relations. In its whiteness, the water carries not just silt but a promise of renewal, of new land emerging from the old, of ecology that resists the fixity imposed upon it.

Yet, the river persists not as an object of geography but as an enduring assemblage of memory, matter, and movement. Even as saltwater now inhabits the channels where fresh water once coursed, the delta people continue to call them Darya, accentuating these waterways as river routes rather than saltwater. The *Darya* does not cease to be a river simply because its waters have shifted; it remains a force, a memory sedimented into the land and the lives of those who dwell with it. The people of the Indus Delta do not conceive of erosion, loss, or damage. To them, the river is not an antagonist but a collaborator in the making and unmaking of deltaic land-waterscapes of the delta. Sitting beside an elder, I listened as he narrated his attitude to the river's coming: *"It was night, and I heard the river. The water was low, but I could hear it coming. I told my sons to prepare as the river was coming. At dawn, it came, and then we all heard it, roaring."*

He did not speak of destruction. When I asked him about the damage, he smiled. *"Rivers never cause damage,"* he said. In its movement, the river was not a force of negation but of renewal. It eroded, yes, but not as an end in itself. It took, but it also gave. He scooped up soil in his hands, his fingers tracing the textures of history and fertility. The land, once white, was a gift of the river's inundation, a blessing that modern

interventions had disrupted. The sociality of the river was the vital process through which life and relations were sustained in the delta.

Far from being a static landscape, the delta has always been a site of emergence, a terrain shaped by the interplay of fluvial movement and human adaptation. When people recall the flourishing ports of the past—Vikkur, Sokhe, ShadBander, Lahori, Debal, Kharrakbandar—they do not merely list names; they invoke an entire assemblage of trade, migration, and circulation as a result of river's sociality in the delta. The rise and fall of each were inseparable from the shifting currents of the Indus, which deterritorialized one space only to open another. Carless, in his memoir of 1836-37 captured this dynamic, witnessing the river's capacity to alter its own geography:

> *The river is entirely altered, the stream and the flat having changed places: the former now runs along the left bank and the latter projects from the opposite side. I should not be surprised if the next inundation were to close the Hujamree completely, and then its seaport, Bunder Vikkur, will probably lose the greater part of its trade. The inundation had swept away the bar entirely, and where there were before only eight feet, there were now eighteen; it had also deepened the river so much that it had become navigable for the largest boats.*

Here, the river does not simply exist within space; it produces space. It creates and erases existing infrastructures and makes new exchange networks possible. The shifting course of the Indus is not a disruption but a condition of possibility, an affirmation that nothing remains fixed, that everything is caught in a state of becoming. This was not a river to be managed, confined within predetermined courses; it was a river that demanded negotiation and required attunement to its fluctuating intensities. The people who lived with the river understood this. They did not seek to impose fixity upon it but to move with it, to engage in a reciprocal relation where the river's geosociality and human and other-than-human sociality were intertwined.

Unstable Grounds: Earthquakes and the Delta's Becoming

Geologists, geographers, and seismologists have shown great interest in the seismic history of the Indus Delta. Lying at the intersection of the Arabian, Indian, and Asian plates, the movement of these plates produces occasional large earthquakes ranging from 7 to 8 magnitude and, more often, shocks of 3-4 magnitude (Bilham et al. 2007). The movement of these plates historically has caused great earthquakes, produced tsunamis, and shaped the landscape and society of the Indus Delta.

Earthquakes do not merely disrupt but instead mark intensities of change, forging new strata, altering river and sediment flows, and shifting the conditions of territorial existence in the delta. The Indus Delta emerges from the movement of the earth, its materiality shaped by the tectonic collision of the Indian and Eurasian plates 45 million years ago, uplifting the Himalayas and Hindukush Mountain ranges where the Indus River originates in the scared peak of Mansarovar (Clift, 2002; Khan, 2021). The flow of the river and its capacity to erode the mountains and transport the sediments, especially after the formation of the monsoon system around 8 million years ago, shaped much of the landscapes of Punjab and Sindh province in Pakistan.

Earthquakes from minor tremors (3–4 magnitude) to major upheavals (7–8 magnitude) compose the delta's event structure, shaping its transformation. In this sense, the delta does not merely endure earthquakes; it is an earthquake in slow motion, its very materiality structured by the imperceptible and subterranean seismic forces always at play beneath its surface (Oguz 2020).

In foregrounding the role of earthquakes in the making and unmaking of the physical and social landscape of the Indus Delta, I turn to geological scholarship and

historical (archival) work rather than replying only to the narratives of the local people (Khan 2019). The last big earthquake that jolted the Indus Delta was in the 1940s; some older people remember it. However, no one remembers past earthquakes, such as those in 1819. I met a nonagenarian who remembers that his grandmother, referring to her parents, told the stories of Allah Bund, which was erected due to the 1819 earthquake. However, his memory does not follow the sequence of events. Recent earthquakes of lesser intensity appear in local people's stories of shifting deltaic landscapes as they encounter physical changes in the delta and assume them to be the effect of earthquakes. On the other hand, geological literature has a more robust understanding of past earthquakes and the changes they brought to the physicality of the delta and deltaic societies.

Archival records provide first-hand accounts of the 1819 earthquakes. For example, during the 1819 earthquake that trembled the Indus Delta from Kutch (now in India) to Karachi, Capt. MacMurdo was stationed at Bhooj, the then-capital of Kutch. His firsthand accounts were later published in various journals during the 1820s. Moreover, Capt. Alexander Burnes visited the Indus Delta almost 10 years after the earthquake and wrote a book-length memoir, providing vivid accounts of the physical and social change the earthquake brought. These sources of information invite us to imagine deltas as more than bodies of water sustaining human and other-than-human beings to a place that emerges through unexpected conjunctures of heterogeneous forces.

The Indus Delta is a perpetual motion landscape shaped by shifting sediments, tidal rhythms, and sudden seismic upheavals. Unlike the predictable rise and fall of tides, earthquakes rupture time, abruptly altering the river’s course, reshaping the landscapes,

and displacing entire communities. These are not mere geological events but forces of transformation, assembling and disassembling worlds in an instant. For example, in 893–894 A.D., the earth shook violently, and Debal, the great port city of Sindh, collapsed. “In 280 aH (anno Hijri), or between March 893 and March 894, there was a terrible earthquake, and a great city in outer India fell down. Fifteen thousand men were dragged from under the dust of the houses which had been thrown down and were buried” (Ambraseys 2004, 506).

Debal, a crucial node in Indian Ocean trade, was no longer viable. As Claude Markovits explains, “A crucial objective of the conquering Arab armies was the port, or rather the ports, of Debal (Daybul), on one of the branches of the Indus delta, which was the main outlet of Sindh” (Markovits 2004, 34). But the earthquake disrupted these flows. The river shifted, and new ports, Thatta and Lahori Bandar rose in their place while Debal dissolved into history. In 980 A.D., another earthquake forced the abandonment of Brahmanabad, leaving only traces of a lost settlement. The cycle continued in 1668 when Thatta suffered a devastating tremor. The village of Samawani disappeared, swallowed by the earth along with 30,000 residents (Oldham 1882). All these earthquakes shifted the Indus River, forcing people to build other towns and ports; the delta is always in the process of becoming. As Bilham et al. 2007 notes,

> *This shift in the course of the Indus was caused by surface deformation following the 1668 earthquake. The eventual settlement of an established path for the Indus near the ruined city of Nerunkot ultimately led to the founding of modern Hyderabad in 1768”* (Bilham et al. 2007, 605).

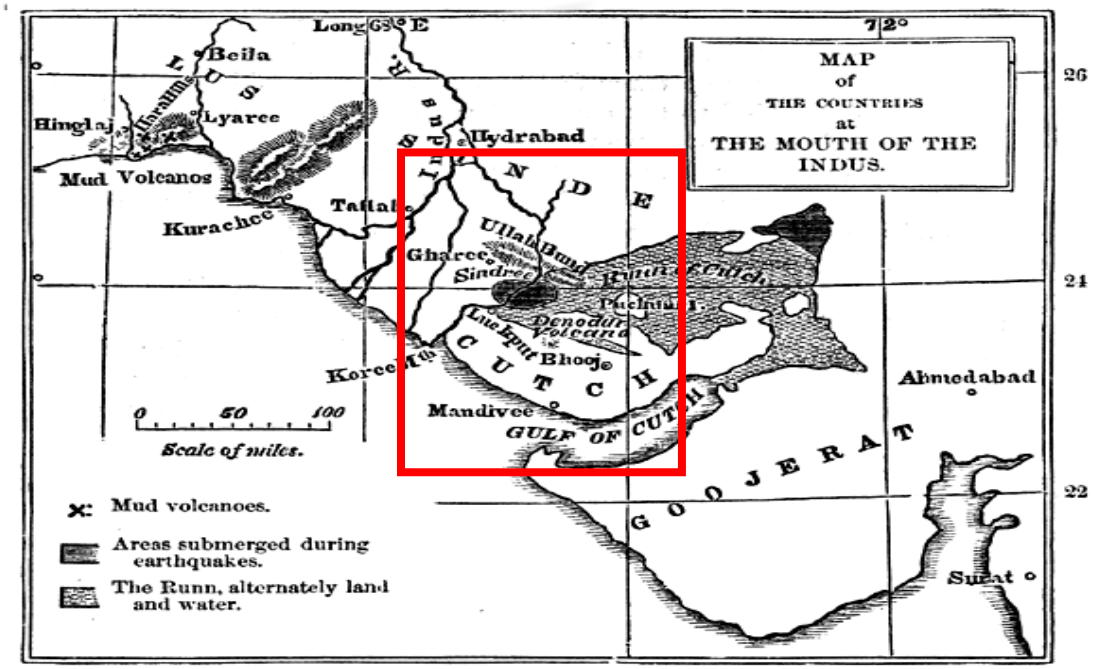
The archival materials have first-hand accounts of the 1819 earthquakes, written by the British colonial officers, who were either stationed in the region or visited the region soon after the earthquake. Not only about the earthquake but their travelogues

inform us about the geological, social, and political events that have been shaping the delta and its people. Before the 1819 earthquake, the Talpurs, the then rulers of Sindh, after losing the war with the rulers of Cutch, erected an embankment called "Ali bund" on the Phurraun branch of the Indus River. The Phurraun branch of the Indus irrigated Cutch, a town in present-day India, sustaining its rich rice fields. Alexander Burnes's memoir describes,

> *By leading it through canals to desert portions of his own dominions, he [Talpur ruler] at once destroyed a large and rich tract of irrigated land and converted a productive rice country, which had belonged to Cutch, into a sandy desert* (Burnes 1973 [1834], 311).

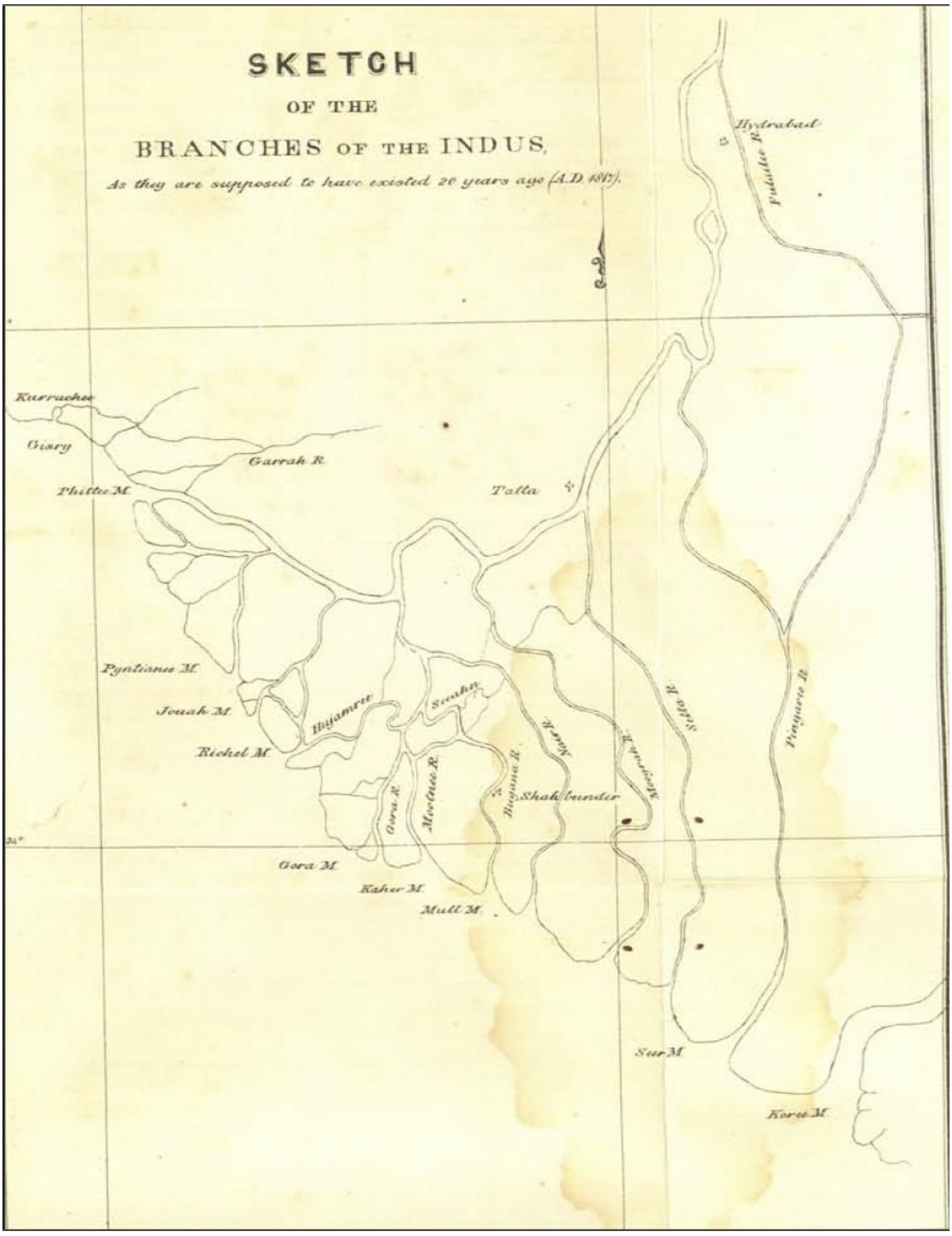
However, in 1819, another embankment was erected by the geological forces. The earthquake of 1819 further altered and diverted the Phurraun branch of the Indus River by erecting a bund called "Ullah Bund," or mound of God. Alexander Burnes, traveling a decade later to the Indus Delta, wrote,

> *But it was soon discovered that this was not the only alteration in this memorable convulsion of nature, as the inhabitants of Sindree observed, at a distance of five miles where the soil was previously low and level. It extended east and west for a considerable distance and passed immediately across the channel of the Indus, separating as it were forever the Phurraun River from the sea. The natives called this by the name of 'Ullah bund,' or the mound of God, in allusion to its not being, like the other dams of the Indus, a work of man, but a dam thrown up by nature* (Burnes 1826, 10).

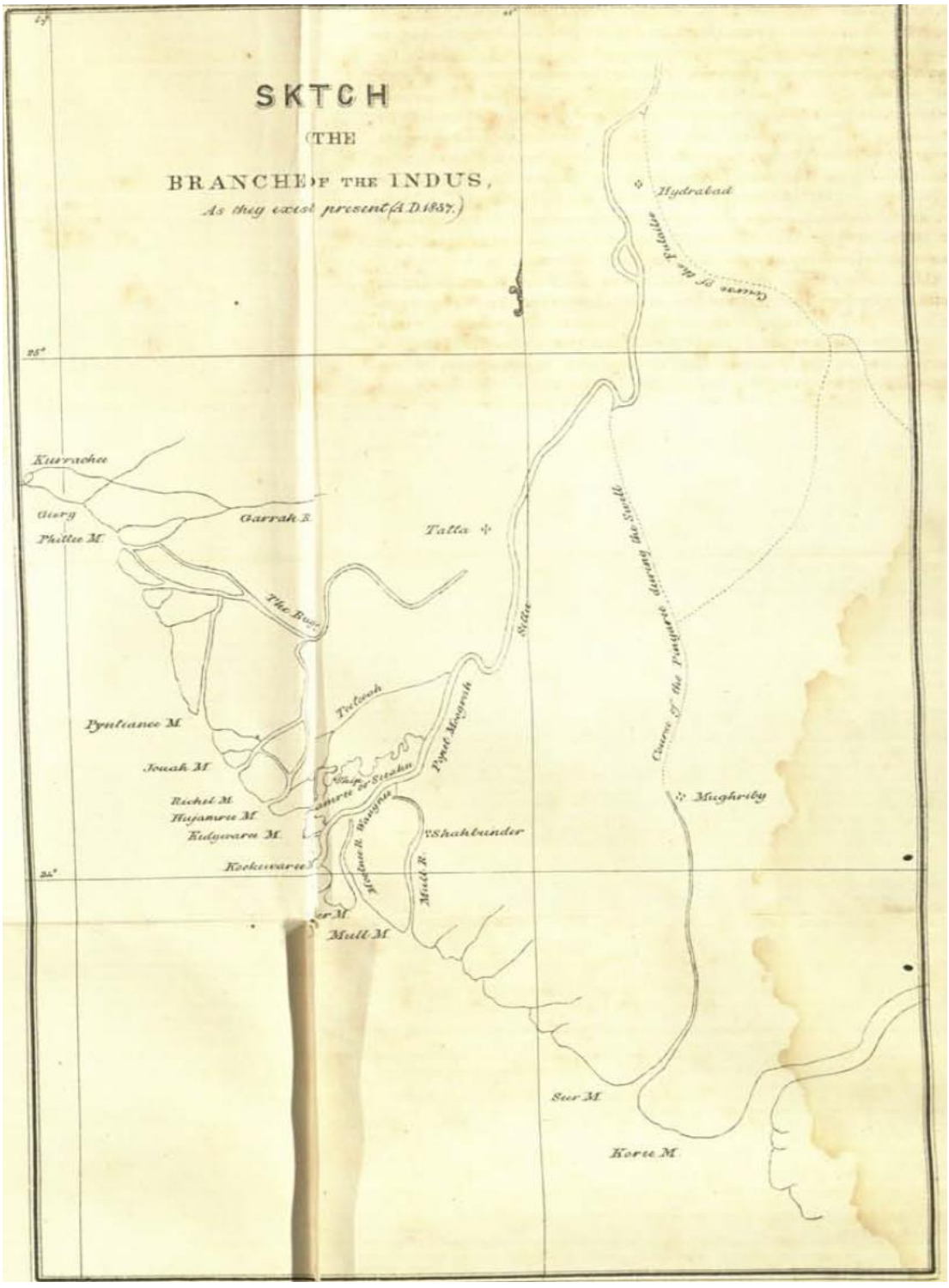


Map 3 - Map from Charles Lyell's book showing the Ullahbund as a black circle in the red box. (*Source:* Lyell 1832)

The earthquake of 1819 also made entry to the Charles Lyell book The Principles of Geology (Lyell 1832). In the book, he argued against established notions of the time that the earth was static. However, he argued that the Earth has changed greatly over time and is changing continuously due to subterranean geological forces. Of several examples, the 1819 earthquake in the Indus Delta was an important example of how earthquakes continuously transform landscapes. Map 2 shows the Indus Delta, and we can see the Ullah Bund in the red box erected between the Indus River branch and Cutch.



Map 4 - Hand drawing of the Indus Delta from 1817, just before the 1819 earthquake (*Source:* Carless 1936)



Map 5 - Hand drawing of the Indus Delta in 1837, after the 1819 earthquake (*Source*: Carless 1936)

These historical records show how the delta has been subject to numerous earthquakes, continuously shaping the Indus Delta physically and socially. During my interviews with the seismologists at the Pakistan Meteorological Department in Karachi, I was told that numerous small earthquakes often shock the Indus Delta but are not usually felt by humans. However, these smaller earthquakes can change the delta's shape by either initiating an erosion process or creating cracks in the land, which are then eroded by sea tides. Seismic data from the Pakistan Meteorological Department on coastal earthquakes from 2009 to 2020 reveal three earthquakes measuring more than 3 on the Richter scale and 33 earthquakes measuring more than 2 on the Richter scale. These are very minor shocks but can have lasting impacts on the physicality of the delta.

Local octogenarians have more vivid memories of the 1945 earthquake. While remembering the event, one said, 'It was early morning when the ground trembled, and we all got up as if someone had pushed us up. In no time, *looaf* (tsunami or a big wave) washed away the houses and lands. We were lucky to have some time, as our village was further away, yet the wave reached our village, but we got enough time to move onto higher ground. Later, when the wave receded, we could see the devastation caused by the *looaf.'* With indifference, he further said, 'All around, we could see the bodies of humans and animals. Bodies were hanging on the trees. We had to take them down and arrange the *kafaen'.* On inquiring about changes he may have witnessed or heard in the delta after the earthquake, he said, 'Land here changes every time. Yes, I heard and saw some changes, but I don't remember exactly. You cannot imagine how big these waves are, and if such big waves come, they change everything.' This was also iterated by a seismologist

at the Pakistan Meteorological Department, who said that if an earthquake measuring 6 or 7 on the Richter scale hits the Indus Delta, it will cause huge damage.

He also remembered places where saltwater turned into sweet fresh water after the earthquake, and where they could find it, it became saltwater. Burnes, too, writes about this transformation, as he says, *"Wells and rivulets without numbers changed from fresh to salt water, but these were trifling alternations, compared with those which took place in the eastern branch of the Indus and the adjacent country"* (Burnes 1826, 08). The river remained calm and quiet for almost a decade, conforming to its flows with the Ullah Band. However, in 1826, the river had its own plans. It flooded and cut through all the embankments, whether Ullah Bund or Ali Bund, and left *"a channel forty yards wide and about three fathoms deep in which the waters of the real Indus were passing to the Ocean . . ."* (Burnes 1826, 11-12). Alexander Burnes believed the Cutch might restore its lost glory of a fertile landscape if such floods occurred for the next few years. The newly opened channel by the Indus River was a blessing for the locals, as they could now navigate the channel to trade with the people of Sindh. Again, Burnes (1826) observed *"several boats laden with 'ghee' (clarified butter) sailing through the reopened channel".*

The Indus Delta is not a stable entity but an ongoing process, a ceaseless becoming where land, water, and life assemble and dissolve in unpredictable rhythms. As rivers carved new paths due to geological forces and intensities, cities emerged while abandoning old ones, and human settlements adapted or disappeared in response. Earthquakes are not merely disruptions but generative forces, continually reconfiguring the relations between people, land, and water. Thus, the delta is not just a place; it is an

event, an unfolding assemblage where histories sediment and erode, and memories linger in ruins buried beneath shifting silt. Living here means knowing impermanence, dwelling in motion, and understanding that nothing is ever fixed. The land is not a passive backdrop to human life; it moves, ruptures, and transforms. And in that becoming, the delta reminds us that the world is never still.

The Pulse of Tides - The Becoming of Delta

نائين جو ننون پاڻي ٿئي ٿو
ڏهين جو ڏنا ٻوڙيندو.
يارهين جو بور
ٻارهين جو ٻور
تيرهين جو تور
چوڏهين جو توڙ
پندرهين جو پور
سورهين جو سور ٽڙيندو
سترهين جو ست چڙي ويندو
اڙهين جو اڏا تي ويندو
ويهن جو وڃان تي ڏنا په سُڪا

Water will become new on the ninth
It will wet the banks on the tenth
Increase by eleventh
Become stronger on the twelfth
Strongest on the fourteenth
At peak, on the fifteenth
It rests on the sixteenth
Becomes weak on the seventeenth
Water will ebb on the eighteenth
Land starts to become visible on the nineteenth
When I see banks on twenty, it is all dry
(A local song about sea tides)

The tides shape the Indus Delta in ways that exceed mere geography. They are not simply oscillations of water levels but rhythms that structure the lives, movements, and imaginations of the people living within this landscape. The delta is an amphibious space,

a liminal terrain where land and water are not stable entities but forces in constant negotiation (Bhattacharya 2020; Samanta and Lahirri-Dutt 2013). Here, waiting is attunement with the deltaic rhythms, synchronizing with the flows that govern existence.

Inside a hut, preparing for a journey into the labyrinth of creeks, I first encountered the full gravity of the tidal cycle. The air was dense, thick with the scent of brine and silt, and the quiet murmurs of the water were an ever-present reminder of the world outside. Yet, despite the urgency of our departure, my guide, an elderly man who had spent a lifetime in this landscape, said: *"We must wait."* I looked outside. The boats rested on the exposed mudflats where water had once carried them effortlessly. My guide gestured toward the receding river and said: *"This is aalarr (ebb)."* In this world, travel is not dictated by the clock but by the water. The boat cannot move until the *veer* (high tide) returns, until the water reterritorializes the land that had momentarily surfaced. The delta is not a static geography but an assemblage of flows—of water, time, movement, and human practice.

Lunar cycles choreograph the movements of the tides, such as land, people, and nonhumans. As the above song depicts, local people do not separate the tide from time; rather, tides are time. The full moon brings *juwaar*, two weeks of heightened tides. Then, with the waning moon, *baagi* arrives, and the tides recede, making way for a different rhythm. These phases, in turn, contain their own daily pulsations of *veer* (high tide) and *aalarr* (low tide). For six to eight hours, the delta will experience *veer* (high tides), and for the next four to six hours *aalarr* (low tide). Thus, two *veers* and two *aalarr* arrive every day. Although people of the delta know these tides, nowadays, during high tides, they can be longer or higher than expected.

The tidal rhythms transform the lands, people, and other non-human beings to flow with the tidal rhythms. As the song depicts, tides transform the land into water and water into land. These transformations are sometimes helpful and other times thwart people's expectations. For example, if high tides are high enough, they can destroy a patch of agricultural land and crops[11]. Moreover, fishers told me the nature of fish is to move against currents. Knowing the tides is important for catching fish. *In juwarr, the best time to catch fish is aalarr* (low tide) *because when juwarr comes veer is too powerful to take our fishing nets.* Thus, to cast their nets, knowing the tides is as important as knowing the fish. The delta intertwines inhuman, nonhuman beings and human socialities. Whether it is travel, trade, catching fish, or even social gatherings, they are tethered to the movement of the tides. The delta is not a landscape to be crossed but a force to be synchronized with. To move through it is to negotiate with its flows, anticipate its shifts, and become part of its cyclical temporality.

When I asked why the tides rose and fell, the response I received was not an abstract scientific explanation, but a story rooted in observation and imagination. *Beneath the ocean,* they told me, *lies a great hole, a vast unseen space where all the fish of the world reside. The sea, like a living being, breathes through this hole. The water rises when it exhales; when it inhales, it retreats. The fish, too, are drawn into this respiration, emerging with the high tide and retreating with the low, woven into the breath of the sea itself.* This narrative is not merely metaphorical; it expresses an attune to the cyclical forces that shape the delta's existence. For the people of the delta, the sea is not an enemy but a friend. One night after dinner, sitting in the bamboo hut, my home in the delta, Jats

[11] In the last part of chapter 2, I thoroughly discuss how tides can be helpful or harmful companions to mangrove conservation.

were reciting the poetry of Shah Abdul Latif Bhittai, a 17th-century Sindhi mystic poet. Jats know the Latif better than anyone else in the world. They orally remember his poetry and pass this tradition to the next generation. While reciting various poems of Latif that night, one of my friends said, *"Latif is asking us to respect and care for the sea."* And he recited,

سيوا ڪر سمنڊ جي، جت جر وهي ٿو جال
سوين سپجن سير ۾، ماڻڪ موتي لال
جي ماسوملئي مال، ته پُوڄارا پُر ٿيئين

Revere the sea, where waters roam free
A realm where countless jewels and gems hide,
With a single touch, your hands turn gold. (A poem by Shah Abdul Latif Bhattai)

But today, this friend has become an enemy for many deltaic people due to riverine infrastructures that trap the water and sediments upstream. As argued above, infrastructures interplay with the riverine and deltaic geological processes, interrupting processes crucial for the delta. With reduced riverine flows – water and sediments, marine processes take over. Saltwater intrusion exacerbates soil erosion. In 1861, the Indus Delta had 17 major creeks, which had been reduced to only one creek by 2000. Geological literature suggests that "since 1944, the delta has lost 12.7 km^2/y of land, altering a stunning 25% of the delta; 21% of the 1944 area was eroded, and 7% of the new delta formed" (Syvitski et al. 2013). Wells and Coleman (1985) claimed that this river-dominated delta is being transformed into a marine (wave) dominated delta. This has impacts as agricultural land becomes saline, Pallo cannot migrate upstream, people

lose their houses and villages to erosion, forcing them to migrate, and mangrove forests are lost[12].

They do not describe the tides as gentle, predictable rhythms often romanticized in stories of the sea. Instead, they consider them more menacing, unpredictable, relentless, and destructive. To him, the tides are not just waves lapping against the shore; they have been transformed into forces of erosion, carving away the land with each rise and fall. One of the fishermen, who lost their home and village to erosion and has now migrated to Keti Bunder, said, *"These tides have crocodile teeth,"* he said, his voice edging with frustration and resignation. *"They eat our land, our villages, and our home."*

Once in the village Geeli Sholani, a major site for mangrove replantation by the Sindh Forests Department. Chacho[13] Geeli was walking me through his village, and with each step, he was telling me different stories of river flows and agricultural fields of red rice that no longer can be seen and how he and his sons have become "eco-guards" of the forests department planting and conserving mangroves. While speaking about these things, he said, *"The sea was hours away by boat from here. Now, the open sea is just half an hour away. And you can see saltwater all around us."* Saltwater intrusion today is not simply erosion but a reconfiguration of existence itself. Where there was once continuity, there is now rupture. Once a force of renewal, the tides are now an encroaching threat. The delta is becoming something new, not through its own rhythms but through external interventions that seek to control, regulate, and fix what was always meant to be in flux.

[12] Please see Chapter 2 on mangrove loss in the Indus Delta.
[13] Chacho in English means uncle. Often, younger people call elders Chacho rather than calling him by his name.

Conclusion

This chapter explores the assemblage of inhuman forces—riverine flows of water and sediments, sea tides, earthquakes, and other geological phenomena—that shape the Indus Delta. Engaging with theories of new materialism and geological anthropology, I adopt a "deep time" perspective (Irvine 2020) to foreground the geological processes that have shaped the delta across vast temporal scales. This approach challenges the anthropocentric narratives of deltas becoming. It highlights how inhuman forces produce the delta and operate in entangled and reciprocal relationships with humans and other-than-human beings. This chapter shifts the anthropological gaze from human agency to the intensities, forms, and properties of riverine and deltaic processes (Khan 2019).

Reframing the delta this way, I argue for an understanding that moves beyond rigid binaries of nature and culture, human and nonhuman, stability and flux. The Indus Delta is not merely a landscape altered by human intervention but a continuously shifting entity, emerging through the entanglements of geological, hydrological, and ecological processes. Through this perspective, we can better grasp how life in the delta is not about *mastering* or *adapting* to nature in a conventional sense but about coexisting with its ever-present forces, which shape and reshape the land and those who dwell within it.

Living in the delta means coexisting with these ever-changing forces to show indifference to the dynamic forces of the river and the delta. Indifference, as argued by Naisargi Dave (2023), is "living with others in their otherness" (Dave 2023, 01). I argue that deltaic inhabitants do not simply adapt to nature as an external force but exist alongside its unpredictability. This coexistence is not a confrontation but a negotiation—a life lived "side by side rather than face to face" (Dave 2023, 1). Whether through the seasonal shifts in river flows, the sudden violence of storms, the slow reworking of

shorelines by sediment transport, or sudden shocks of coastal earthquakes, deltaic life is shaped by an ongoing engagement with inhuman forces. Naveeda Khan suggests that nature is not something to be overcome and mastered, but it is something that springs up with us (Khan 2023, 15). Deltaic inhabitants respond to these forces by adjusting to shifting ecologies, sometimes taking advantage of new formations and conceding to environmental transformations. This relationship does not fit within dominant narratives of control over nature; rather, it reflects a deeper entanglement in which inhuman forces are always at play with humans and other-than-human beings co-producing life in the delta.

The brief ethnographic vignette provides a concrete example of how humans and other-than-human beings experience the deltaic geological processes. One evening in the Indus Delta, as pre-monsoon winds howled and dark clouds gathered, villagers stood outside their huts, watching the sky. A man pointed toward the distant sea: “It is raining there—heavily.” Another asked, “Will it come here?” The first man observed the wind’s direction. “Yes, in an hour or so.” Their conversation soon drifted to memory—1999, the typhoon year. “These winds are not the same,” one insisted, though the unease remained. The rain was brief that night, but the tides surged elsewhere in the delta. The next morning, when I visited a nearby creek, camel caretakers stood covered in mud, their faces marked by the night’s struggle. “The *veer* was too strong,” one said. “It nearly drowned us and the camels.” They debated whether to move deeper into the mangroves, fearing the next tide. One lamented, “I told you we shouldn’t have come.” Another countered, “But how could I have known about the tide?”

This is a story of lives of inhuman processes and biotics that are never still. Here, tides and other geological riverine and deltaic processes do not simply return; they become intense and entangled with biotic lives. This is becoming a delta in the entanglement of geo and biosocialities. Winds do not pass; they transform. The delta is not a fixed geography but an unfolding process, a ceaseless interplay of forces, water, sediment, memory, and adaptation. To live here is not to resist the tide but to move with it, to become with it, in a world where land and sea are never quite themselves but always something in the making.

Moreover, by problematizing the sediment/water divide and moving away from the water-centric exploration of the delta, I foreground the interplay of sea tides, river flows, and geological shifts to contribute to the anthropology of deltas and, more specifically, to amphibious anthropology (Krause 2017) by exploring the life of the delta, rather than only life *in* the delta. Rather than viewing deltas as products of infrastructural change, this approach recognizes them as dynamic assemblages shaped by ongoing negotiations between human and inhuman forces.

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CHAPTER 3

The Will to Improve: Governance Image of Thought and the Indus Delta

Introduction

On the chilly morning of December 4, 2020, about 20 locals gathered at the office of an international conservation organization to attend a one-day workshop on the Local Adaptation Plan of Action (LAPA) in Gharo, a small town in Pakistan's Indus Delta. LAPA is a bottom-up, institutionalized planning framework to address local communities' needs amid the Indus Delta's degradation (Chaudhury et al., 2014). This workshop was organized to incorporate local perspectives into strategies for adapting to climate change challenges in the region, such as soil erosion due to sea-level rise, saltwater intrusion, cyclones, irregular flooding, and droughts. The consultant explained the workshop's objectives as the (male) participants gathered. Using photos and videos on his laptop, he illustrated how sea-level rise, cyclones, droughts, and floods affect the Indus Delta's people. During a group activity where participants listed the challenges they faced, a young man identified *boodh* (flood) as a major issue. He stated, "*Asan lai boodh wado masalo aa.*" (For us, flooding is a huge problem). This prompted a debate when an older participant, around 65, disagreed. Raising his trembling hand, he politely asked, "*Asan wat bodh kadhen khan maslo aa, en, bodh man tawahan je cha murad a?*" (Since when has flooding been a problem for us? And what do you mean by flood?). The young man clarified: "*Munjho matlab a te jehn nadi man pani ghano endo a and asan ja fasul and*

ghar tabah kare wendo a" (By flood, I mean when the river overflows with much water, destroying our crops and homes). He referred to the devastation caused by the 2010 megaflood. The older man patiently responded, "I have never heard of flooding being a problem here [in the delta]. The people of the Indus Delta have always prayed for the river to flow abundantly throughout the year. If our houses and farms, built on the river's natural paths, are destroyed, it's not the river's fault."

In subsequent conversations with locals, I learned that they rarely use the term "flood" when describing river flows. For them, the river simply "flows." Riverine floods are, in fact, vital ecological events for deltas like the Indus. Research in physical geography and fluvial-coastal geomorphology highlights the importance of sediment in "creating and maintaining delta structures" (Edmonds et al., 2011, cited in Passalacqua et al., 2013, p. 1838; see also Zoccarato et al., 2018; Ritchie et al., 2018). High river flows transport vast amounts of sediment to lower riparian areas, forming deltaic lands—what locals describe as "the river claiming the lands from the sea." However, upstream infrastructures such as dams and barrages trap water and sediment, reducing the river's velocity and capacity to carry sediment. As a result, sediments settle upstream instead of reaching the delta, leading to cascading effects. Reduced sediment deposition accelerates soil erosion due to saltwater intrusion.

Despite these dynamics, most development initiatives in the Indus Delta focus on flood management and control. For instance, during my fieldwork, the Asian Development Bank (ADB) was negotiating with the Sindh Government for the $400+ million Sindh Coastal Resilience Project. The project's first component emphasized "integrated flood management schemes." If, as both local knowledge and deltaic

geomorphology suggest, high river flows (or "floods") are critical for the delta's health, it raises an important question: What is the Sindh Coastal Resilience Project and similar initiatives aiming to achieve in the delta?

This contradiction underpins my inquiry into what "delta improvement" entails and how these schemes impact human and non-human communities. I explore how governance organizations conceptualize the Indus Delta and what vision of the delta they promote when they "will to improve" it (Li, 2007). One of the central challenges for governance organizations is identifying the “culprit” behind the delta’s degradation. Is it the altered flow of the Indus River? Climate change and its associated sea-level rise? Resource exploitation by local communities? Pollution? Or perhaps a combination of these factors? I argue that the rationale of improvement schemes is shaped by how governance organizations “find” the culprit and define the “degradation” of the delta. In this chapter, I aim not to assess the success or failure of various improvement schemes. Instead, I adopt Tania Murray Li’s “critical stance” to “prize open expert knowledge and expose its limits” (Li, 2007, p. 2). My focus lies on the discursive practices, narratives, and mechanisms through which organizations identify the culprits of the delta’s degradation and how these inform the logic behind various improvement schemes. Following James Ferguson, I further analyze “what [improvement schemes] do” (Ferguson, 2006, p. 272; Ferguson, 1994) in the delta. As Ferguson argues, “the real importance, in the end, lies in the ‘side effects’” (Ferguson, 2006, p. 272) of these interventions.

I also examine what happens when these improvement plans and interventions encounter the material and multispecies realities of the delta. Improvement schemes do

not operate in isolation; they interact with the delta's dynamic processes, forces, and multispecies communities, which complicate and mediate the implementation of these plans in unexpected ways across multiple scales. I propose a political ecology framework informed by new materialist and multispecies perspectives to address this complexity. This framework highlights how improvement schemes interact with and are reshaped by the delta's material and the multispecies world, often complicating their envisioned outcomes. In conclusion, I argue that identifying the delta's degradation "culprit" through expert knowledge and devising improvement schemes reflects a habitual "development image of thought." This approach simplifies the complexity of the Indus Delta while homogenizing knowledge about these issues—and, by extension, their solutions. As a result, it marginalizes or renders alternative solutions obsolete (Sachs, 1997; Ferguson, 1994; Escobar, 2008; Li, 2007; Rademacher, 2011). Ultimately, this approach risks exacerbating environmental challenges and vulnerabilities for human and non-human communities in the delta, raising the critical question: "Improvement for whom?"

Literature Review

This chapter puts political ecology, multispecies ethnography, and new materialist approaches into the conversation to elaborate a unique account of the degradation of the Indus Delta and the will of governance organizations to improve it. I argue that the sustained critique of political ecology, which is "politics without ecology," can be addressed by collaborating with the emerging fields of multispecies ethnography and new materialism. In this chapter, I follow the contours of the ways the degradation of the Indus Delta has been invented over time and its improvement imagined. I also show ethnographically how the material's performative character and the Indus Delta's

multispecies world hold sway on improvement schemes, influencing these schemes either by conforming to or evading expert practices and plans.

Political ecology (PE) has now long examined environment-society relations and ecological distribution conflicts (Martínez Alier 2002; Escobar 2008; Sultana 2021). Following the political economy perspective that revealed how the modern economy creates an unequal distribution of resources, early political ecologists foregrounded how this unequal distribution is maintained by the dominant Western capitalist discourses, which outline and enforce a specific way of interacting with nature in which nature remains an instrument to human (Western) knowledge and culture (Blaikie 1985; Ferguson 1994; West 2005; Li 2007; Biersack 2006; Escobar 2008; Robbins 2012). Scholars argue that this domination is maintained by discursive practices that invent and deploy scientific and Western knowledge to define nature and environmental problems and, therefore, the solutions to those problems.

Political ecology has benefited from its interface with various theoretical traditions. It is informed by feminist studies (Sundberg 2016; Rocheleau et al. 2013), Science and Technology Studies (STS) (Latour 1993; Law 2004; Mol 2002), critical development studies (Escobar 1992, 2000; Sidway 2002), subaltern studies and postcolonial studies (Parkash 1992; Chakrabarty 1992; Guha 1989; Spivak 1988), to name a few. At the heart of all these traditions is an idea that "patriarchal Western capitalist modernity" (Escobar 2018, ix), a civilizational model during a particular time in history, created the "great divisions" (Latour 1993) of female/male East/West, and culture/nature in which the latter categories always dominate in defining the former

(Escobar 2018, ix). Political ecology manifests how such domination is maintained institutionally.

Political ecologists ask whose knowledge counts (Escobar 1998) when speaking about nature (Brosius 2006). Tracing the genealogy of Western discourses and discursive practices, political ecology refers to the 19th-century Western colonial era when a specific worldview of forests, land, and rivers as a resource was only invented and deployed (Shiva 2010). This worldview's core is Western nature-culture dualism, which envisions nature as wild, passive, and separate from culture, waiting to be meaningful only through cultural means. This has shaped the forms of engagement with nature, foreclosing other ways of knowing. This is a form of colonialism where the physical violence of colonialism turns into slow violence (Nixon 2013) in the name of development (Ferguson 1994; Escobar 1995), environment (Luke 1998; Brosius 1999; Agrawal 2005), resource management (Shiva 2010), and biodiversity conservation (West 2005).

Following this, Sultana (2022) called climate change discourse climate coloniality. Other scholars call it “carbon colonialism” (Bachram 2004; Bumpus 2010). Climate or carbon coloniality is the “domination, displacement, degradation, impoverishment” of local and Indigenous people, lands, and waters “perpetuated through REDD+ programs, neoliberal conservation projects, rare earth mineral mining, deforestation for growth, fossil fuel warfare, and new green revolutions for agriculture” in the name of climate change, global warming, and sea level rise (Sultana 2022, 4-5). The climate change narrative perpetuates carbon trading and sequestration as the key elements in the post-COP-22 world. Despite scholars warning of how carbon trading in

the name of climate change is creating inequality, displacement, and the destruction of local ecologies (Bachram 2004; Bumpus 2010) and transforming human and other-than-human relations (Chao and Enari 2021), global organizations are enforcing these as a key solution to climate change. Scholars argue that this climate coloniality works clandestinely to promote capitalist market-based (Arsel and Buscher 2012; Fletcher et al. 2016) and geo-engineering (Reynolds 2019; Sikka 2012) solutions to mitigate the impacts of climate change. It forces the most vulnerable local population to adapt to climate change by changing their lifeways (Felli 2021). The ignorance of the global elite of local histories of landscape, people, and other-than-human beings has dire consequences for the already marginalized people (Sultana 2010; Paprocki 2021; Vaughn 2022). Political ecology manifests this ongoing colonial and postcolonial genealogy of Western knowledge and its domination and appropriation of nature through a planned social change linked to economic growth and development, as well as how this changes the local environment, people, and the relations between them.

Political ecology has been illuminating in uncovering power dynamics, especially demonstrating how Western nature-culture dualism works on the ground and has caused the environmental crisis. However, it "reduces 'everything'—even materiality [including other-than-human beings] —into a matter of language or some other form of cultural representation" (Barad 2003, 801). Even in the discourse of climate coloniality, coloniality is elaborative; however, it is at the risk of putting the climate aside as passive and secondary. Perhaps, among the various critiques[14] leveraged on the field, the most sustained critique of political ecology is that it is "politics without ecology" (Bassett and

[14] Please see Knudsen (2023) for more detailed discussion on criticism on political ecology by various other theoretical traditions.

Zimmerer 2004, 103; Vayda and Walters 1999) and guilty of human exceptionalism, ignoring the agentive character of other-than-human beings in shaping society, politics, and even capitalism (Srinivasan and Kasturirangan 2016). Scholars have defended political ecology against such criticism (Walker 2005; Menon and Karthik 2017). However, recent works in the environmental humanities – multispecies ethnography and new materialism – present a more nuanced political ecology approach to bringing ecology back as an ethnographic protagonist without losing politics.

In human geography, political science, and other disciplines, political ecology informed by material and multispecies ethnography is often referred to as a more-than-human turn (Whatmore 2006; Bennett 2010; Whatmore 2013; Margulies and Bersaglio 2018; Schulz 2017). Anthropologists have recently shifted their gaze to the confluence of political ecology and multispecies ethnography, exploring the intricate histories of humans and nonhuman beings (Helmreich and Kirksey 2010; Kohn 2013; Tsing 2015; Odegen et al. 2016; Govindrajan 2018). However, anthropologists have given less attention to the materials, and especially to "planetary processes" (Connolly 2013, 2016; but see Khan 2019), what Tim Ingold called the "missing nonhumans" (Ingold 2012, 429). Thus, it is important to give "matter and [planetary processes] their due as an active participant in the world's becoming" (Barad 2003, 803). A political ecology informed by the new materialism and multispecies ethnography would manifest the complex interplay of materials, planetary processes, other-than-human beings, and humans in shaping the world. This chapter informs how the Indus Delta's degradation and improvement is a matter of entanglement of material and the multispecies world of the delta with discursive practices of governance organizations.

Multispecies ethnography (MSE) opens ethnographic fieldwork to a more-than-human world. In their introduction to MSE, Eben Kirksey and Stefan Helmreich write that "creatures previously appearing on the margins of anthropology-as part of the landscape, as food for humans, as symbols–have been pressed into the foreground…" (Kirksey and Helmreich 2010, 545). Making other-than-human beings protagonists allows scholars to explore the ways diverse living beings such as mushrooms (Tsing 2015), meerkats (Candea 2010), forests (Kohn 2013; Mathews 2018), microbes (Helmreich 2009; Kirksey 2015; Keck 2020), ants (de Carvalho Carbral 2015), and plants (Hayden 2003; Archambault 2016; Hartigan Jr. 2017) have shaped human lives, politics, economies, and culture. Multispecies environmental historians, for example, have revealed the ways plants, animals, and microbes migrated with human invaders during European colonization, undermining local communities – human and otherwise (Crosby 1986; Mastank et al. 2014; Anderson 2004). Thus, "the genocide of the Americas [and other Indigenous territories] was also genocide of all manner of kin: animals and plants alike" (Davis and Todd 2017).

Making manifest this more-than-human genocide of local multispecies kin in the name of development, modernity, and capitalism becomes the focus of multispecies ethnography. For example, Feralatlas[15], an online digital multimedia interactive web book led by Anna Tsing with contributions from various scholars (2021) provides more comprehensive multispecies histories of colonial and ongoing genocide. They show that current environmental crises were triggered during the invasion of the European empire

[15] https://feralatlas.supdigital.org/modes/grid?cd=true&bdtext=isc-dump

and have continued and accelerated during modern capitalism that brought us into the Anthropocene – an ecological era defined by human impacts on geological strata.

Where these multispecies ethnography scholars foreground the troubled multispecies histories of the current environmental crisis, Anna Tsing (2015) evokes hope following Matsutake mushrooms, which refuse to surrender against capitalist destruction. Matsutake grows in the blasted landscape left behind by capitalist ruins, helping to grow multispecies entanglements (see also Kim 2022; Brown 2017; Tsing et al. 2017; Kirksey 2015; Kirksey et al. 2013). A political ecology informed by multispecies ethnography makes manifest such intricate histories of global politics, history, and culture, forcing us to remember that "there are other worlds around us" (Raffles 2010, 12), and "we have never been human" without these other worlds – the worlds of our other-than-human beings' companions (Haraway 2008; Latour 1993).

Other scholars foreground abiotic histories, arguing that multispecies histories do not happen in a vacuum. Rather, they are played out on the physical Earth. Alternatively known as new materialism (Coole and Frost 2010), vital materialism (Bennett 2010), agential materialism (Barad 2007), Actor-Network Theory (Latour 1993), Object Oriented Ontology (Herman 2018; Bogost 2012; Bryant 2013; Behar 2016), material feminism (Alamo and Heckman 2008), and posthumanism (Braidotti 2013), these and other scholars decenter human agency as a measure of everything, going beyond anthropocentrism. In so doing, they argue for a "flat ontology" that "does not privilege some kinds of entity or agency over others" (Coole 2013, 454). They also eschew the Western dichotomy of living and nonliving (Povinelli 2016), as well as nature and society (Malm and Hornborg 2014, 62). Scholars working across new materialism focus on the

entanglement (Barad 2007) and assemblages (Bennett 2010) of materials, humans, and other-than-human beings and how the material world has shaped the living world.

Where political ecology foregrounds the power dynamics at work in marginalizing and making obsolete certain people and their knowledge, new materialism urges us to look around us and the ways those same colonial and capitalist power structures have marginalized and rendered passive things and materials – including "the multiple forces, process, and properties of the earth itself" (Clark and Gunaratnam 2016: 16). A few scholars have further argued that this colonial imagination of materials as inert informed the way black and brown people were imagined. In other words, matter and certain categories of people are for exploitation. These scholars bring the theory of race, earth, and slavery into focus to argue that "historically, both slaves and gold must be material and epistemically made through the recognition and extraction of their inhuman properties (Yusoff 2018, 03; Oguz and Whittington 2024). This conceptual mark between the living and non-living provides fertile terrain for past and ongoing colonial capitalists' extractive industries. Thus, for these scholars, it is important to manifest the "grammar of geology" in the ways the concept of the inhuman "traffics between *inhuman as matter* and the *inhuman as race*" (Yusoff 2018, 05 italics original).

Following this, it becomes important for scholars to demonstrate planetary processes as "actants" rather than as passive and inert matter. Scholars argue that the "self-organizing amplifiers and internal volatilities of planetary processes" (Connolly 2017, 16) "perturb and excite" (Clark 2011, xiv) humans and other-than-human beings and shape relations among them (Clark and Szerszynski 2021; Yusoff 2018; Connolly 2017 and 2013; LeCain 2017; Clark 2010; Coole and Frost 2010; Latour 1993; White

1996; Haraway 1988). Calling for a “political geoecology" (Dalby 2016: 34) and geological anthropology (Oguz 2010), various scholars explore “geological life” – that is, the “corporeality of geology as a material embodiment…that has geopolitical and biopolitical consequences for the possibilities of being and nonbeing” (Yusoff 2018, 03).

On the other hand, anthropologists are interested in how Indigenous peoples’ conceptualization of rivers and mountains, which emerge as animate beings, challenge this Western division of life and nonlife. Povinelli (2016) formed the concept of “geontology” or “geontopower” which is “a set of discourse, affects, and tactics used in the late liberalism to maintain or shape the coming relationship of the distinction between Life and Nonlife” (Povinelli 2016, 04). However, her Indigenous colleagues in Coastal Australia conceptualize “a woman becoming the river”. Such Indigenous concepts refuse to surrender to present-day concepts of late liberalism and, in doing so, become “*diagnostic* and *symptomatic* of the present way in which late liberalism governance difference and markets in a differential social geography” (Povinelli 2016, 15; see also de la Cadena 2105). Within this geosociality, scholars are exploring the interplay of the materiality of sea/waves (Helmreich forthcoming and 2014), technology (Brunn 2022; Ingold 1997), waste (Stamatopulou-Robbins 2019), infrastructures (Anand et al. 2018; Jensen and Morita 2017); water (Attala 2019; Strang 2014; Linton 2010), sediments (Parrinello and Kondolf 2021; de Micheaux et al. 2018), earthquakes (Clark 2011) mountains (de la Cadena 2015), rivers (Strang 2014) and climate change and sea-level rise with politics, culture, and economy, as each shape the other.

The above literature has been floating in academia for over a decade now, but they rarely crisscross. Where a few anthropologists have wonderfully shown the interplay

of political ecology and multispecies ethnography. In human geography, especially, the amalgamation of political ecology and new materialist approaches has brought to discipline what Sarah Whatmore (2006) called "materialist returns," showing the ways the vitality of things and entities shapes the world around us. However, in this chapter, I argue a broader approach where the political ecology, multispecies ethnography, and new materialist approaches must inform each other. In doing so, the approach will explore the discursive formation of power structures and the ways power structures take advantage of the capacities of things and beings. For example, below, I show how governance organizations exploit the conformation of one mangrove species in shaping the delta. This is about taking advantage of the capacity of beings. However, beings and things do not always conform; they might have their own plans and, in turn, shape the governance organizations' practices.

Political ecology solely focuses on discourses and discursive practices, and because of that, it has been subject to criticism. However, the marriage between political ecology, multispecies ethnography, and new materialism will allow scholars to shift the protagonist of this research from discourses to beings and things to show how the discourses define the beings and entities in certain ways to scale up certain qualities and capacities. According to Tsing (2015), capitalists do not produce certain raw materials such as coal and oil. Rather, it existed long before capitalism (Tsing 2015, 63). However, it is about producing conditions, mechanisms, and institutions to exploit the coal and oil that make capitalism without thinking about the future. In that case, we scholars cannot leave the materials and other beings at the mercy of discourses. Rather, they should be protagonists to tell how the discourses have scaled up particular qualities and, in doing

so, have neglected other capacities of things and beings. Foregrounding neglected capacities of beings and things and how local people experience beings and things allows a different world to emerge, the world of many worlds (Blaser and de la Cadena 2018).

Methodology

I adopted the "concept" of the delta as a methodological framework. This approach acknowledges that "thinking voice no longer emanates from the unique essentialist [human] subject" (Mazzei 2017, 676; Pierre 2017; Colebrook 2013). Accordingly, I extended the concept of the Indus Delta beyond its physical boundaries to explore a wide range of sources, including archives, scholarly journal articles, geomorphology, and physical geography literature, news articles, official and personal accounts, travelogues, and reports from government and non-government organizations concerning the Indus River and delta. I also observed various meetings, workshops, and seminars organized by governmental and non-governmental entities related to the Indus Delta. For instance, I participated in the LAPA workshop, a two-day workshop on the Dutch Fund for Climate Development project, *Discovering Bankable Projects in the Indus Delta Ecoregion Landscape,* and several community meetings. These activities aimed to understand how these actors construct narratives around the degradation of the Indus Delta and rationalize their proposed improvement schemes. Additionally, I joined field teams during mangrove plantation seasons to observe how mangroves are cultivated and positioned as agents of ecological improvement for the Indus Delta.

I conducted 24 semi-structured and key informant interviews with directors, managers, and field officers from various organizations, including the Sindh Forest Department, World Wide Fund – Pakistan (WWF-Pakistan), International Union for

Conservation of Nature (IUCN), Pakistan Fisherfolk Forum, Sindh Fisheries Department, Coastal Development Authority, and Sindh Planning Commission. To further trace the concept of the delta, I analyzed grey literature such as project proposals, mid-term and final reports, presentations, and brochures. I also examined the websites of these organizations to investigate the rationale behind their projects and how they conceptualize the delta. Archival research at the Sindh Archives in Karachi and the British Library in London allowed me to trace the genealogy of the delta, its degradation, and its proposed improvement during the colonial period.

Additionally, I interviewed local Indus Delta residents and participated in participant observation when possible despite the challenges posed by the COVID-19 pandemic. Conducting ethnographic fieldwork during the pandemic required careful adherence to safety protocols. I followed the guidelines provided by the World Health Organization (WHO) and the University of Georgia's Research Resumption Plan, which outlined ethical and safe methods for conducting research during the pandemic. As a result, I adopted a hybrid approach that included in-person and virtual semi-structured interviews, participant observation, and field visits, which were conducted per these safety protocols.

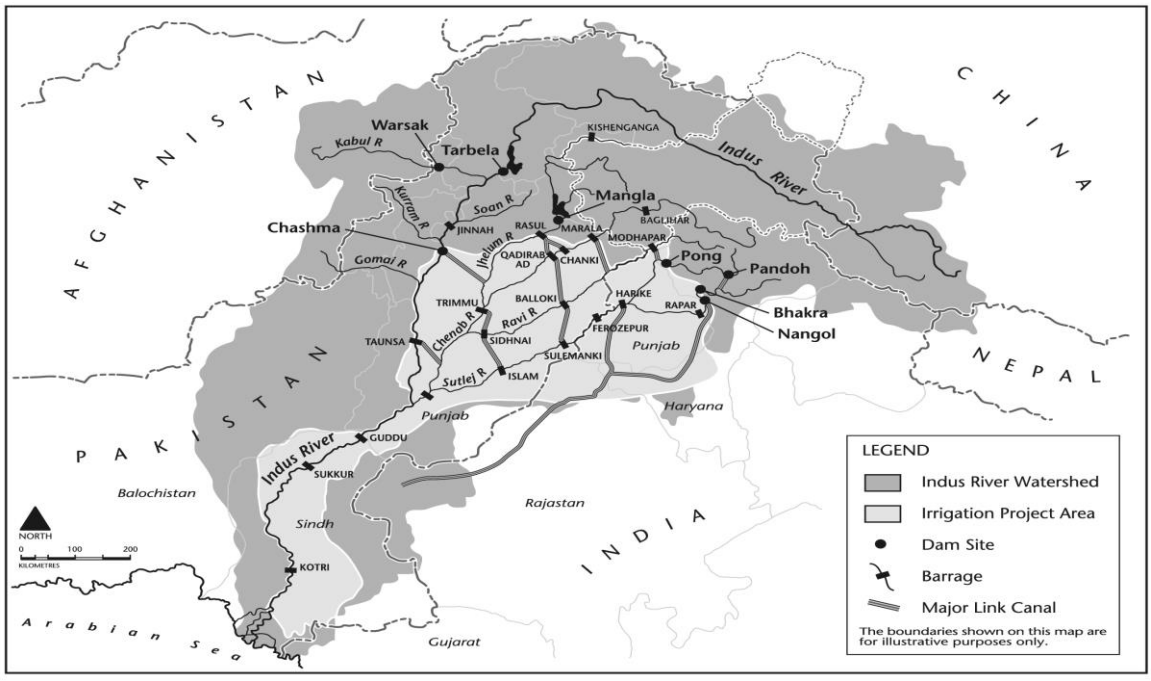
Political Ecology of Water in Pakistan and the Indus Delta

The Indus River Basin is among the largest river basins in the world. Originating from the Mansarovar Mountain ranges in Tibet, the river flows through India and predominantly traverses Pakistan before emptying into the Arabian Sea in the south. In Pakistan, several tributaries—Jhelum, Chenab, Ravi, Beas, Sutlej, and Kabul—join the Indus at Panjnad, contributing to its might as one of the world's most powerful rivers. From Panjnad, the Indus flows into Sindh, a region named after the river (Indus = Sindhu, hence Sindh). The fertile alluvial plains of Sindh, including the fan-shaped Indus Delta—ranked as the fifth largest delta globally—result from the river's historical and ancient flows.

Following the annexation of Sindh by the British in 1843 and later under the postcolonial governance of Pakistan after the partition of India in 1947, the Indus River began to be viewed primarily as a resource. Between 1932 and 1976, massive hydroelectric dams and barrages were constructed, with additional dams, barrages, and headworks continuing to expand this network. As a result, the Indus River Basin became home to one of the largest irrigation infrastructures in the world. These efforts aimed to control the river for "perennial irrigation for areas now served by numerous inundation canals" (Sukkur Barrage Report 1919, 14) and to "increase and reclaim" agricultural land (First Five-Year Plan Book, vol. II, 144). This infrastructural development fundamentally altered the river's historical relationships with the land and its ecosystems, affecting human and non-human species.

This engineering history is further intertwined with water disputes between India and Pakistan. After the partition in 1947, ideological tensions between the two nations led India to block water flows into Pakistan for 18 days in 1948 before resuming them (Hayat

2022). For Pakistan, this event underscored a critical dependency on water controlled by India, which it perceived as an "existential crisis" (Mustafa 2010). Prolonged negotiations ultimately culminated in the Indus Waters Treaty (IWT) of 1960, brokered by the World Bank with financial support. Under this treaty, India retained exclusive rights over the three eastern rivers—Ravi, Beas, and Sutlej—while Pakistan secured rights to the three western rivers—Indus, Jhelum, and Chenab. The agreement also established the Indus Waters Commission, comprising representatives from both nations and a neutral World Bank expert, to resolve disputes arising from water-sharing issues (Haines 2017). While IWT is widely regarded as a successful model for managing transboundary water conflicts, ambiguities within the treaty have been exploited by both nations, leading to recurring disputes. In recent years, these tensions have intensified significantly (Mustafa 2010; Jamir 2016; Haines 2017; Akhter 2019).



Map 6 - Dams and barrages on the Indus River (Source: Mustafa et al. 2017)

National water conflicts, particularly between the upper riparian province of Punjab and the lower riparian province of Sindh, frequently arise alongside transboundary disputes. These conflicts trace back to the colonial era when British administrators constructed canals in Punjab, diverting and trapping water that reduced the flow of the Indus River downstream in Sindh. British irrigation engineers cited this reduced flow as a key justification for constructing the Sukkur Barrage to secure Sindh's future water supply (Musto, n.d). Following the partition of India in 1947, these tensions intensified as Pakistan's postcolonial administration built additional upstream infrastructure. In 1991, all four provinces reached a consensus to sign the Water Apportionment Accord (WAA), which established the Indus River System Authority (IRSA). IRSA oversees the Indus River's flow and allocates water to each province based on river availability and provincial needs (Mustafa 2010). Despite these measures, ambiguities in terms of both the Indus Water Treaty (IWT) and WAA have allowed water-sharing disputes to persist.

Recently, water-related conflicts have been exacerbated by the narrative of an impending water scarcity crisis in Pakistan. Using the Falkenmark Index Value (Falkenmark 1989)—a (post)Malthusian framework linking water availability to population growth—Pakistani authorities and experts predict the country will face acute water scarcity by 2030. According to the World Bank, Pakistan transitioned from being water-stressed in 2000, with 1700 cubic meters (m^3) per capita, to a more dire situation with 1500 m^3 in 2002. Current estimates suggest water availability has dropped to 1090 m^3 per capita and could decline below 1000 m^3 by 2030-2035 (Briscoe and Qamar 2006).

This narrative of scarcity, combined with ongoing water disputes with India, fuels Pakistan's water politics and justifies the construction of more dams. For example, in 2018, Pakistan's Chief Justice launched a crowdfunding campaign to build the Diamer-Bhasha and Mohmand Dams, urging citizens to contribute to the "dam fund" to secure the nation's future. The initiative gained widespread support, echoed by the Pakistan Army, the Prime Minister, other state institutions, and the public. The Chief Justice likened the public's enthusiasm to the fervor seen during the 1965 war with India (Hayat 2022). This rhetoric of addressing water issues as a national security and existential crisis mirrors the hydro-infrastructure logic of the 1950s (Akhter 2017; Akhtar et al. 2021). Thus, Pakistan's water scarcity is deeply entangled with regional politics, historical legacies, and socio-economic structures rather than solely a matter of physical water availability and population size (Mustafa 2010; Mustafa et al. 2017; Akhter 2019; Hayat 2023).

Amid these dynamics, the Indus Delta has been largely neglected and degraded. Given that riverine sediment deposition processes shape those deltas, it is critical to understand how rivers like the Indus transport sediments. Sediment transport depends on various factors, including climate, geology, area, precipitation, soil type, vegetation, and topography within the river basin. Precipitation provides water to the basin, while the lithology (rock structure), pedology (soil type), and vegetation determine the river's sediment erosion capacity. Gravity and slope provide the energy necessary for sediment transport along the river channel (Charlton 2008).

Delta formation, occurring at the river's mouth, the basin's farthest part, requires substantial energy. G.K. Gilbert (1884) succinctly described the process, which remains a foundational principle in geomorphology: "The capacity and competence of a stream for

the transportation of detritus are increased and diminished by the increase and diminution of the velocity [of the river]" (cited in Wright 1985, 09). As river velocity decreases, sediment transport capacity diminishes, leading to sediment deposition at the river's mouth. When sediment supply declines, marine erosion processes dominate, eroding previously deposited materials. Thus, an active delta relies on a river supplying sufficient sediment to outpace marine erosion processes.

More than the political decisions, upstream infrastructures, IWT, and WAA interplay and interrupt the geomorphology of the Indus River, which, in turn, has transformed the Indus Delta. The Indus River flow data shows a significant reduction in water flow downstream of Kotri towards the Indus Delta after the construction of dams and the signing of the Indus Water Treaty in 1962. This reduces water flow and the river's carrying capacity to transport the suspended sediments toward the delta. With decreasing sediments, soil accretion and saltwater intrusion cause soil erosion to increase. As Well and Coleman (1985) argued, this has, and will, further transform the Indus Delta from a riverine to a marine delta. This transformation changes the lives and livelihood of humans, other-than-human beings, and their relations.

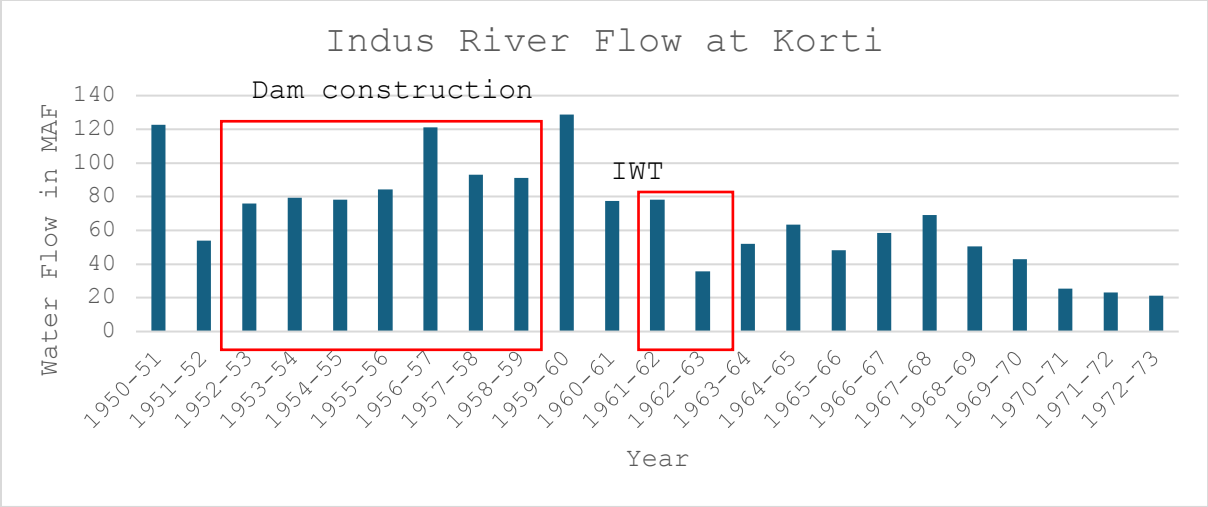


Figure 3. Indus River Flows, 1950-1973 (Unpublished data from the Indus Water Commission collected by author)

The Indus Delta has been systematically neglected and marginalized within this political and environmental history. Below, I trace how the narrative of the delta's degradation has been historically constructed and how these narratives have shaped subsequent improvement schemes. I highlight how the perceived causes of the delta's degradation have shifted over time, influenced by governance organizations' efforts to "identify" the problem and align it with their proposed solutions.

The Politics of Degradation and Improvement in the Indus Delta

During the aforementioned LAPA meeting, a consultant attributed the degradation of the Indus Delta primarily to climate change. While presenting various videos and images of floods, rising sea tides, land erosion, and other environmental issues, he stated:

> *"Dekhne, jo kuch yahan ho raha he whoo mosmayati tabdeeli ke wajha se ho raha he. Samandar ka agee bharna ek international masala he. Hum kuch nahine kar sakte. Haan hum adopt kar sakte hen. Jo ap log phele se kar rahe ho doosare kamanee ke raste dhoondh kar. Lakeen hum ap ke bataon se sekh kar, international experts ke sath beth kar, ek asia plan banana chahte hen jiss se ap logon ke masayal kum se kum hon."*

> *"Look! Whatever is happening here [in the Indus Delta] is due to climate change. The sea-level rise is an international issue [caused by global problems]. We cannot address this global issue directly, but we can adapt. You are already adapting by seeking alternative livelihood opportunities. We will learn from you and then collaborate with international experts to develop a plan that minimizes your challenges."*

Today, climate change and sea-level rise have become dominant frameworks for understanding the degradation of the Indus Delta. This discourse legitimizes improvement schemes aligned with adaptation to climate change, such as mangrove conservation, flood embankments, and urbanization. Conversely, initiatives unrelated to climate change, such as the conservation of Pallo fish (Indus Shad – *Tenualosa ilisha*), which holds cultural, aesthetic, and religious significance for local communities, are often deemed less critical or unwarranted (Albania 2008).

In this section, I explore the historical evolution of narratives surrounding the degradation of the Indus Delta. I examine the performative role of climate change discourse in identifying the "culprit" of degradation and the improvement schemes that follow. Additionally, I highlight the interactions, alliances, and tensions among communities, human and other-than-human, within these shifting narratives of delta degradation and their implications for governance and local livelihoods.

History of Improvement Schemes in the Indus Delta

The history of administrative interventions to improve the Indus Delta dates back to the British colonial period. Following the annexation of Sindh in 1843, the British administration took control of the delta. It was used as a transportation route for goods and raw materials between the Arabian Sea and the northern regions of Sindh and Punjab. However, a tragic incident in which Lieutenant Chapman, a young British railway engineer, and 27 crew members drowned after a floating dead tree near Kotri struck their

boat highlighted the dangers posed by debris in the river. The British administration identified this debris as “one of the most serious dangers of navigation on the Indus,” necessitating constant surveillance of its channels (Atiken 1907, 356). In response, the Indus Conservancy Department, also known as "The Conservancy," was established to conduct “scientific” studies and monitor the river. The department’s primary objective was to remove dangerous snags from navigation channels. Its workforce, equipped with numerous steamers and dredgers, was tasked with “cleaning the river channels… and keeping open the mouths of the larger canals when silted” (Atiken 1907, 358–359). These measures were implemented to improve the river for navigation purposes.

There were no significant administrative interventions in the Indus Delta for over a century. The colonial administration managed the river as a resource, while the delta was considered separate from the river. However, the dynamic and unpredictable nature of the delta—where land continuously submerges into the sea and reemerges—posed challenges for both colonial and postcolonial administrations. This instability thwarted their attempts to govern the delta and hindered economic activities (Bhattacharya 2018; Lahirri-Dutt and Samanta 2013). Indeed, the British decision to construct a railway network to transport goods was partly driven by the difficulties of managing the downstream river and delta (Atiken 1907). Consequently, both colonial and postcolonial administrations focused their efforts on the upstream river, where irrigation infrastructure could be more easily implemented by treating the river as land separate from water.

The Indus Delta regained attention in the 1970s when the adverse effects of upstream infrastructure on the delta began to emerge. The Sindh Forest Department (SFD) initiated efforts to increase mangrove biodiversity to create a resilient mangrove

ecosystem and combat saltwater intrusion. Tahir Qureshi, a forest officer widely known as the "Mangrove Man" and Baba-i-Mangrove (Father of Mangroves) in Pakistan, conducted “scientific experimentation” involving assisted natural regeneration, artificial regeneration of suitable species and large-scale plantation efforts. These included planting “foreign species” imported from the Baluchistan coast, Bengal, Vietnam, the Philippines, and other coastal regions worldwide. Despite these efforts, the experiments largely failed to increase biodiversity. The delta lost four Indigenous mangrove species (Qureshi 1993; Saifullah 1997). According to forest officers, the primary reason for these failures was the ecological differences between the Indus Delta and other deltas from which foreign species were introduced. One officer explained, “Those four species were very shy and delicate. They always needed fresh river water. With the altered river flow and the changing deltaic ecology, they could not bear the stress and became extinct.”

Sustained administrative interventions in the Indus Delta began to take shape in the 1990s when the negative impacts of upstream infrastructures further exacerbated the region’s degradation. Agricultural fields were lost, villages were submerged by saltwater, forcing local populations to migrate inland, and the once-thriving mangrove ecosystems began deteriorating. Fish populations, particularly the migratory Pallo, declined, while wetlands, lagoons, and estuaries—vital buffers between land and sea—crumbled due to saltwater intrusion. In response to the socioeconomic impacts of this "degradation," the Sindh provincial government established the Coastal Development Authority (CDA). The CDA's mandate was to “improve the socio-economic conditions of coastal communities,” as one Deputy Director of the CDA explained to me during an interview. The CDA's focus, primarily staffed by civil and irrigation engineers, was on building coastal

infrastructure. These projects included flood embankments, road construction, floating jetties, drinking water pumps, cold storage facilities for fish, and support for local fisherfolk's livelihoods.

From the early 2000s, the presence of governance institutions in the Indus Delta became more sustained and rigorous. This period coincided with a drought (1999-2002) in Pakistan, during which rainfall was significantly reduced, leading to water flow scarcity in the Indus River (Ahmad et al. 2004). The impact on the delta was more severe than in other parts of the river basin, as the administration diverted the limited water available into agricultural fields to grow crops. Social safeguard projects were introduced in the delta in response to these emerging challenges. A key initiative was the Sindh Coastal and Inland Community Development Project (SCICDP), a multimillion-dollar project funded by the Asian Development Bank (ADB) and implemented by the Coastal Development Authority. The project framed the degradation of the Indus Delta as a result of "excessive water abstractions and disruptions to upstream hydrology," which were further compounded by property rights conflicts between farming and fishing communities, mismanagement of marine resources, and the lack of enforcement of environmental laws (ADB, Technical Assistance Report, 1-2). Notably, the SCICDP operated on the assumption that "there will not be any water flow to the Indus Delta" (ibid, 03). This acknowledgment of the altered flow of the Indus River as the primary cause of the delta's degradation shaped the improvement schemes implemented during this time.

However, following this period, a radical discursive shift occurred in the narratives surrounding the degradation of the Indus Delta. This shift can be attributed to

several factors. The Intergovernmental Panel on Climate Change (IPCC), in its 2007 report, highlighted multiple climate-related issues in Pakistan, including "decreasing trends in annual mean rainfall (472); a 0.6 to 1.0°C increase in temperature in coastal areas, with the loss of 10 to 15% of the coastal belt (475); increased droughts due to El Niño impacts, with consecutive droughts in 1999 and 2000 (476); and rising sea levels (484)," among others (IPCC 2007). Following this report, Pakistan developed its first National Climate Change Policy in 2012 and signed the Paris Agreement in 2016. These reports, policies, and agreements provided the Pakistani government with the justification to shift the narrative surrounding the degradation of the Indus Delta from upstream infrastructures to climate change and sea-level rise induced by climate change.

The degradation of the Indus Delta is also a politically charged issue, given the ongoing distrust between provinces, particularly between Sindh and Punjab, as discussed earlier. This shifting narrative served to fulfill the long-standing desire of the federal government to deflect responsibility for the degradation of the Indus Delta by attributing it to other factors. The discourse of climate change provided an ideal framework to shift attention away from the impacts of upstream infrastructures and toward global issues such as rising temperatures, sea-level rise, and broader climate change concerns. Below, I explore how climate change has come to be seen as the primary culprit for the degradation of the delta, sidelining or at least marginalizing other contributing factors while simultaneously offering a rationale for the proposed improvement schemes.

The Climate Change Card: The Only Culprit of the Delta's Degradation Today

Climate change has become a significant concern in the Indus Delta since 2010. Funded by the European Council under the Environment and Natural Resources Thematic

Program (ENRTP), the Climate Change Adaptation Program (CCAP) was launched between 2011 and 2015. While the project frames the degradation of the delta in terms of climate change, it also advocates for the need for environmental flows. According to the project's documentation, environmental flows are not just about establishing minimum flow levels but also encompass all elements of a natural flow regime, including floods and droughts, which are crucial for controlling the characteristics and natural communities of a river (Bajwa and Dehlavi 2013, 06). These views were echoed by the regional director of a conservation organization that implemented the CCAP project. During an interview, he stated, "It is a rubbish statement that water flowing into the sea is a waste of water. Ecology, too, has rights. Even if we had followed the 1991 water accord, the problems of the Indus Delta would not have been as severe as they are today." However, when asked to prioritize the issues in the Indus Delta, he identified climate change and climate-induced migration as the top concerns, omitting any mention of the altered river flow or environmental flows as significant problems.

The CCAP project also identifies two major problems in the Indus Delta: floods and storms/cyclones. The hazard mapping study justifies interventions due to the increasing frequency and intensity of coastal storms, cyclones, and floods. The 2010 floods, which were attributed to “unprecedented monsoon rainfall” caused by climate change, were singled out as the primary culprit, resulting in disastrous impacts (CCAP Hazard Mapping Document, 23). In response, the project aimed to mobilize and educate coastal communities on climate change adaptation, introducing the concept for the first time. Adapting to floods was also a new concept for these communities, as the 2010 floods had rejuvenated the delta, and they hoped for similar floods annually.

After 2015, climate change became an even more urgent issue in governance interventions. A report presented to the Senate's Standing Committee on Science and Technology warned of the "seriousness of sea [saltwater] intrusion" in the coastal areas of Sindh and Balochistan, predicting that areas like Badin and Thatta could sink within 30 years, with Karachi potentially submerged by 2060 (Senate Science and Technology Standing Committee report, March 11, 2015). The mention of Karachi, Pakistan's economic backbone and main port city, was alarming for national and provincial administrations. The report cited saltwater intrusion, especially the loss of mangroves, as a key cause. Various deltaic improvement schemes were launched to mitigate saltwater intrusion and protect the coastal areas, particularly Karachi.

Numerous mangrove conservation projects have been launched in the Indus Delta with international funding; all rationalized as responses to climate change and climate change-induced sea-level rise. A review of these projects reveals that none fail to identify climate change as the cause of the delta's degradation. Some notable projects include:

1. *Sustainable Management of the Mangrove Ecosystem* (2015), funded by the German Federal Ministry for Economic Cooperation and Development (BMZ), which attributes mangrove loss to "persistent unsustainable use and erosion caused by climate-induced sea-level rise" (Project Proposal Document, 09).
2. *Climate Change Adaptation Program (CCAP),* which emphasizes climate change adaptation.
3. *Mangrove for the Future*, focusing on the impact of climate change on coastal ecosystems and the role of mangroves in combating it.

4. *Sindh Coastal Resilience Project (SCRP),* financed by the Green Climate Fund of the Asian Development Bank, which views climate change as the primary threat to the Indus Delta, proposes solutions like flood embankments and mangrove conservation.
5. *Indus Delta Ecoregion Landscape (IDEL) Bankable Project*, funded by the Dutch Fund for Climate Development (DFCD).

Additionally, the Local Adaptation Plan of Action (2020-21), a policy document developed by an international conservation organization, identifies sea-level rise as the major issue in the delta. The report mentions "climate change" 27 times in 36 pages, compared to a single mention of “reduced flow.” These projects and reports demonstrate that local and national administrations view climate change, particularly sea-level rise, and floods, as the primary cause of degradation, with mangrove conservation and flood embankments being the primary solutions. This does not mean climate change or sea-level rise are not contributing factors to the degradation of the Indus Delta. According to the GermanWatch Global Climate Change Risk Index 2020, Pakistan is ranked 5th among the top 10 countries most affected by climate change, particularly in extreme events like floods and cyclones (Eckstein et al. 2019). With its tidal flat topography, the Indus Delta’s location in the intertidal zones means even a slight sea-level rise can cause significant erosion (Rabbani et al. 2008).

However, climate change and its impacts, such as sea-level rise and floods, have become the sole causes of the delta’s degradation. The late CEO of Pakistan FisherFolk, an NGO advocating for the delta’s fisherfolk, expressed disagreement with this view: “I always disagree with the government and non-government organizations that climate

change is the cause of the degradation of the [Indus] Delta. Climate change may exacerbate the problems caused by upstream irrigation infrastructures, but it is not the main cause."

Despite this, flood control projects, including the new Sindh Barrage, planned 45 km upstream of the delta, continue. In response to the 2010 megaflood, which discharged 50-60 million MAF of water into the sea, hydrologists argue that this discharge is a "wastage" of valuable resources. The Sindh Barrage is designed to store 2 million-acre feet (MAF) of floodwater, which will be used for irrigation. Experts argue that the barrage will help ensure a continuous water supply for the delta during dry seasons, alleviating issues such as saltwater intrusion. The government contends that the barrage will provide more drinking and irrigation water, improve vegetation, and restore the mangroves, addressing the ecological needs of the delta.

Local communities and civil society are skeptical of the Sindh Barrage. The late CEO of Fisherfolk Pakistan vehemently opposed the idea, arguing that "every dam or barrage is a nail in the coffin of the Indus Delta, and Sindh Barrage will be the last nail." He criticized the government's contradictory stance, noting that while Pakistan is projected to become water-scarce by 2030, they are building a barrage to store excess floodwater. He questioned the viability of spending billions on a barrage that would only store 2 MAF of water, enough for the delta's needs for just two years. As Akhter Majed notes, "dams [and other large infrastructures] are not just tools that can be applied instrumentally to solve a given problem," they can worsen the delta's ecological state by altering the river's geomorphology.

In addition to large infrastructure, mangroves have been identified as key to combating climate change-induced sea-level rise and saltwater intrusion in the delta. Pakistan has recognized climate change as a major development issue, incorporating it into national policies, including the 2014 Climate Change Policy. As part of its efforts, Pakistan launched the "Billion-Tree Tsunami" project in 2014, later expanded to the “Ten Billion Tree Tsunami 2019-2023,” aiming to restore forests, including coastal mangroves, to fight climate change.

Mangroves are central to the fight against climate change due to their exceptional carbon sequestration capabilities, often called “blue carbon.” Globally, they have gained attention as a form of climate change mitigation (Breithaupt et al. 2012; Duarte et al. 2013; Woodroffe et al. 2016). A study by the Ministry of Climate Change and UN-REDD Payment for Ecosystem Services (PES) valued mangroves for their benefits: wastewater cleaning (USD 103.6 million), cyclone mitigation (USD 1.2 million), ecotourism (USD 662,163), mangrove wood (USD 2.8 million), and coastal erosion protection (USD 995,919). The total value per hectare is USD 3,850.

The Sindh Forest Department’s Chief Conservator highlighted the carbon credit potential of mangroves. A 2013 study by Merilyn International (renamed Indus Delta Capital) estimated that the mangroves could absorb 127 million tons of carbon. The current lowest price of USD 15 per ton could generate billions of dollars in revenue, with the full mangrove area offering even greater potential. Many improvement schemes focus on mangrove restoration. The mangrove cover had shrunk from 300,000 hectares in the past to 39,000 hectares by 2000. However, efforts have increased to 150,000 hectares,

with future plans to restore the mangrove landscape to 300,000 hectares or even 600,000 hectares, according to the Chief Conservator of the Sindh Forest Department.

During my fieldwork, I grappled with the challenge of where governance organizations find land to plant mangroves amid soil erosion. Saltwater erosion has altered 25% of the Indus Delta, submerging 15 million hectares of land (Syvitski et al., 2013). Mangroves, which grow at the sea's edge, are the first line of defense against saltwater intrusion and the first victims of it (Woodroffe et al., 2016). Despite this, governance organizations are planting mangroves on abandoned agricultural lands. A District Forest Officer (DFO) proudly pointed to areas along the creeks, calling them barren wastelands now used for mangrove plantations. However, these were once agricultural lands from the 1960s that have since become saline.

This practice of reducing the Indus Delta to barren lands fit for mangrove plantations due to climate change challenges exemplifies "climate coloniality" (Sultana 2022; Bachram 2004), which enforces Eurocentric ideas, neocolonialism, and neoliberal conservation while disregarding the local landscapes, histories, and human-nature relationships (Chao and Enari 2021). The transformation of the Indus Delta into a mangrove-centric landscape also erases its rich agricultural history. Once a fertile region for various rice varieties, including red rice, the delta was abundant with fruit trees like mangoes. Locals recall the variety of crops and fruits grown here before the land's fertility was compromised by salinity.

The transformation of the Indus Delta into homogenous mangrove landscapes represents a form of land colonization (Fairhead et al., 2012; Lyons and Westoby, 2014), where experts, policymakers, and organizations dictate the "best use" of the land—

mangrove plantations to mitigate climate change. This perspective disregards the region's historical agricultural practices, such as red rice cultivation and fruit gardens. While necessary for addressing climate change, Mangrove restoration projects erase the complex, multispecies relationships that once defined the delta's landscape.

The new climate coloniality also reconfigures local relationships with mangroves. Many villagers, especially agriculturalists, were previously disconnected from the mangroves, which they rarely interacted with except for occasional wood collection. When conservation organizations educate locals about the importance of mangroves for soil protection and typhoon mitigation, they neglect to acknowledge the region's historical reliance on these landscapes. Moreover, introducing eco-guards—locals tasked with protecting mangroves—has led to tensions with the Jat community, camel herders who once lived in the mangrove areas. These new regulations disrupt traditional practices and create conflict where harmony once existed.

Climate coloniality in the Indus Delta also promotes neoliberal conservation, focusing heavily on mangrove restoration while neglecting the conservation of Pallo, a fish with significant cultural, religious, and economic importance to local fisherfolk. Pallo is not part of climate change adaptation efforts and, as a result, is not prioritized in conservation projects. The lack of resources and personnel in the Sindh Fisheries Department further hampers Pallo conservation efforts, with the Director General lamenting the inability to enforce laws or raise awareness about the issue.

The climate change narrative used to rationalize delta improvement schemes performs several functions. First, it diverts attention away from other causes of degradation, such as the altered flow of the Indus River, deforestation, and pollution.

Second, it frames the problem as a technical, global issue that shifts focus away from local water politics. Third, it attracts international funding, with NGOs and government institutions tailoring proposals to climate change concerns, often overlooking local issues. Fourth, climate change narratives perpetuate colonial racial politics by blaming the most affected communities for the degradation of the delta, forcing them to adapt. Finally, this focus on mangrove ecosystems oversimplifies the complex deltaic ecology, reducing the region to an "out-of-the-way place" (Tsing 1993). However, this place is far from passive, as it interacts with expert practices and shapes their outcomes, often creating frustration among those implementing these projects. The next section will explore the "agency" of the river, deltaic processes, and the multispecies world that influence expert interventions.

Agency of the Deltaic Process and Multispecies World

In this section, I explore how the ecology of the Indus Delta influences the development and outcomes of improvement schemes. I argue that the deltaic processes and the multispecies world are not passive or inert in response to governance initiatives aimed at climate change mitigation. Instead, they play an active role in shaping these schemes. Improvement projects in the delta involve complex entanglements between humans and other-than-humans, and governance organizations work to navigate these connections to address climate-related challenges. However, these plans often fall short as the delta's ecological dynamics and non-human entities do not always align with the governance organizations' intentions. This mismatch forces organizations to adapt their strategies in response to the unpredictable and resilient nature of the deltaic environment.

Topography and Geophysical Processes

Sitting in his newly renovated lavish office financed by international donors in Karachi, the Chief Conservator of the Sindh Forest Department highlights the complexities of mangrove restoration efforts in the Indus Delta. Finding suitable land for mangrove plantations is deeply entangled with more-than-human factors, requiring satellite technology and on-the-ground fieldwork. The challenge of identifying the right soil texture—particularly silt-rich soil, which is ideal for mangroves—illustrates the dynamic relationship between governance organizations and the environment. While satellite images can point to potential sites, they are not always sufficient for understanding the nuanced variability of the land. Field teams must visit these sites, assess them in person, and carefully examine soil content to determine whether the land can support successful mangrove growth.

Even when silt-dominated landscapes are found, the land may still be unsuitable due to hidden layers of sand or the unpredictability of sea tides and typhoons that can alter the soil composition. Furthermore, the absence of river flows and the continuous supply of fresh sediments and freshwater, which historically support the delta's fertility, exacerbate the difficulties of mangrove restoration. In this context, the success of mangrove plantations is contingent upon the governance organizations' ability to negotiate with the delta's ecological forces. This process reflects the entangled relationship between human plans and non-human agency in the deltaic environment.

The Chief Conservator of the Sindh Forest Department's insights highlight the critical role of soil texture and elevation in the success of mangrove plantations in the Indus Delta. Soil elevation is crucial for mangrove growth, particularly within the

intertidal zone (where sea tides meet the land). He explains that the optimal elevation should be at sea level or within one meter above or below it, allowing the mangroves to experience regular tidal inundation. This exposure to both high and low tides is essential for the mangroves, as they require continuous access to saltwater for proper growth. However, this optimal range is increasingly difficult to maintain due to the impact of soil erosion, a process exacerbated by high sea tides that weaken the soil beneath the surface. The soil becomes more permeable and susceptible to submergence when the soil is eroded. While mangroves' root systems help stabilize the soil and prevent further erosion, it takes years for the mangroves to establish strong roots—typically five to seven years for a mature tree and up to ten to twelve years for a full mangrove forest. This timeline presents a significant challenge for the success of new plantations, especially when considering the increasing frequency and severity of cyclones due to climate change.

With more frequent cyclones, which can wash away large portions of mangrove forests and deposit sand that alters the soil composition, the future of mangrove plantations becomes more uncertain. The increased intensity of cyclones means that governance organizations face heightened risks in planting mangroves, as these forces of nature can disrupt even the best-laid restoration plans. The combination of soil erosion, altered tidal patterns, and more intense storms force governance organizations to constantly adapt their approaches, raising questions about the long-term viability of mangrove restoration in the face of ongoing climate change challenges.

The complex interplay between mangroves, sea-level rise, and governance efforts in the Indus Delta highlights the difficulties faced by conservation organizations. As noted, mangroves are often viewed as protectors against the impacts of sea-level rise, but

the phenomenon they help mitigate is also a significant threat to their survival. The rise in sea level in Pakistan, averaging 1.1mm per year, gradually transforms the intertidal zone into land too submerged for mangrove growth (Kanwal et al., 2020). This creates a paradox where the land necessary for mangrove plantations may soon become unsuitable due to the advancing sea-level rise. Additionally, sea-level rise contributes to the deposition of sand, which disrupts the soil composition, further hindering mangrove growth. The challenge for governance organizations lies in the uncertainty of how quickly these changes might occur, especially regarding the landscape's transformation and the potential disruption to mangrove growth cycles. Whether mangrove plantations will survive long enough to mature and protect the land from erosion remains unanswered.

The delta's processes, including soil erosion and tidal variations, complicate identifying ideal plantation sites. For instance, small creeks experience less wave pressure than larger creeks or channels, and these sites have historically been targeted for mangrove plantations. However, as these areas are exhausted, conservation organizations are being pushed to consider planting in the open sea, where stronger waves pose a greater challenge for mangrove survival. Despite these challenges, governance organizations prioritize restoring silt-dominated, fertile lands for mangrove plantations, which are considered the most suitable environments for successful growth. The optimistic hope remains that previously abandoned and barren lands can be revitalized through mangrove planting to protect against soil erosion. The success of these climate change mitigation schemes rests on the belief that the deltaic lands can regenerate and restore the ecosystem, as they have done in the past. However, as the ongoing challenges

with sea-level rise, soil erosion, and changing tidal dynamics demonstrate, the future of mangrove restoration in the delta is uncertain and deeply entangled with environmental and ecological forces beyond human control (de la Bellacasa, 2013; 2019).

In the Indus Delta since the 1970s, governance organizations have attempted to increase mangrove biodiversity, starting with eight species. However, only four species remain today, with 90% of the mangrove population dominated by *Avicennia marina*. The challenge of biodiversity preservation is more pressing than ever for governance organizations. To understand why earlier efforts to enhance mangrove biodiversity were unsuccessful, I spoke with the project manager of a conservation project in the delta, who holds a master's degree in botany and taxonomy. He explained, "The simplest reason is that this habitat was unsuitable for those species." He elaborated that "we cannot just plug and grow different mangroves. Each species has specific habitat requirements."

Inquiring about the extinction of four native species, he mentioned that they were "shy and sensitive" species. By this, he meant that when the delta's ecology transformed due to the altered flow of the Indus River, these species could not withstand the stress of the changing conditions. As a result, they degenerated and were eventually lost. This sensitivity remains a concern for the remaining species, with some struggling to survive under similar pressures. Of the four remaining species, they primarily cultivate two – *Avicennia marina* and *Rhizophora mucronata* – in their nurseries. Bachando Jat, a 65-year-old former camel herder who now manages seedlings, expressed concern about other, more delicate species. He stated that they are "*nazuk*" (sensitive), requiring significant time and care to manage. Jat noted that these species often fail when shifted to planting sites, dying without adequate moisture or becoming too weak to establish

properly. Therefore, he prefers not to risk growing them due to potential losses in time and resources.

This view of mangrove species as "shy," sensitive, and responsive reflects what Natasha Myers (2015, 43) refers to as "enchantments" with the "vegetal sensorium." This concept implies that plants are "open, responsive, excitable, and attuned to the world" (Myers 2015, 06). Over more than two decades, governance organizations have closely worked with mangroves in the Indus Delta, and this perception of mangroves shapes their plans and practices. It is essential to highlight how improvement schemes, deltaic geological processes, and the multispecies world interact and influence each other. Governance organizations that previously ignored mangroves must work with these other-than-human actors. The deltaic lands, once considered "wastelands," have become critical players in the success of governance organizations' efforts to improve the delta. This complexity becomes evident when considering how governance organizations imagine the degradation of the delta, especially given the challenges posed by climate change. The improvement of the delta hinges on the interactions among various actors, such as mangroves, deltaic lands, silts, sand, mud, sea waves (both high and low), inter-tidal zones, typhoons, camels, people, fish, and others.

Conclusion

As I write this conclusion, Pakistan experienced one of the worst floods in recent history in October 2022. That year's monsoon changed its usual direction and brought unprecedented rainfall. Rains exceeded 175% of average levels for Pakistan, with southern Sindh receiving more than 400% of the typical rainfall. This climate change-induced unpredictable monsoon wreaked havoc across the country, leading to internal

displacement and loss of lives, property, livestock, and crops. However, the people of the Indus Delta greeted the floods with joy. Due to the excess rainfall, the river swelled, and the administration opened the huge steel gates of the Kotri Barrage, allowing the river to flow into the delta. When I called my acquaintances in the Indus Delta to check on their situation, their voices were calm and jubilant. They shared that although the banks of their village were submerged due to heavy rains, they viewed the flood as a blessing from Allah. They expressed gratitude for the river water, which would allow them to cultivate crops, and noted that fish, particularly Pallo, were abundant that year. They also mentioned that the river had pushed the sea away, creating new fertile lands.

These comments from the people of the Indus Delta highlight the dynamic, more-than-human nature of the delta – a place inhabited by saints, fish, people, mangroves, and other beings, all interacting with the pulsating river and the sea. Human and non-human beings in the delta have attuned to the temporal rhythms of riverine and deltaic flows. The Indus Delta exemplifies the mutual becoming of these diverse entities. However, this relationship has been disrupted by colonial and postcolonial infrastructures upstream, which trap water and sediment, reduce the river's velocity, and undermine its ability to carry suspended sediments to the delta. As one government official involved in delta improvement schemes told me during an informal discussion at a workshop, the solution to the delta's problems "is to destroy all the dams and barrages and let the river flow into the sea [full stop]. But nobody is talking about the water, the river. We are proposing solutions to improve everything but the delta."

In this study, I use a political ecology framework to explore the politics of "improving everything but the delta" and the consequences this has for deltaic

communities – human and non-human alike. I argue that the degradation of the delta has been discursively constructed during colonial and postcolonial times, shaping the improvement schemes that align with the political needs of those periods. For example, today, climate change and sea-level rise are blamed for the delta's degradation, and solutions such as mangrove plantations are proposed to mitigate the impacts of climate change.

However, I also demonstrate how mangrove conservation enforces what Sultana (2020) calls *climate coloniality* or *carbon colonialism* (Bumpus 2010). Climate coloniality dispossesses local communities, transforms their relationships with one another and with the non-human world, prioritizes the conservation of species that meet capitalist needs (like mangrove species known for carbon sequestration), and turns the heterogeneous, dynamic delta into a homogenous mangrove landscape. Furthermore, it diverts people's grief from social movements against the state. It shifts the burden of the delta's degradation onto the most vulnerable – local communities forced to alter their lifeways. This creates painful trauma, as locals are encouraged to forget the once-thriving, multispecies delta and instead participate in delta improvement programs. However, this climate coloniality and its improvement schemes always interact with the material and multispecies world of the delta. Governance organizations attempt to harness this world, sometimes aligning it with their plans and encountering it in forms that evade or resist their strategies.

A more-than-human political ecology best captures the complexity of this relationship between the delta and governance organizations, one that integrates emerging theoretical approaches such as multispecies ethnography and new materialism

(Bennett 2010; Whatmore 2013; Margulies and Bersaglio 2018; Schulz 2017; Braun 2004). A more-than-human political ecology emphasizes not only the discursive practices that have constructed the delta as an "out of the way place" (Tsing 1993, 10) but also the ways in which the material and multispecies world of the delta holds sway over the making and unmaking of the region. This approach reveals how species and materials sometimes conform to governance organizations' plans and, at other times, act in ways that thwart these plans, demonstrating non-conformity that challenges the assumptions of such practices (Vaughen 2017).

Moreover, a political ecology informed by multispecies ethnography and new materialism can address the sustained critique of political ecology for being “politics without ecology” (Bassett and Zimmerer 2004, 103; Vayda and Walters 1999), and for neglecting the agency of non-human beings in shaping society, politics, and even capitalism (Srinivasan and Kasturirangan 2016). By centering the role of other-than-human beings, materials, and planetary processes as protagonists in shaping the Indus Delta, a more-than-human political ecology helps break free from conventional "development thinking." It encourages us to view the delta not as a “wasteland” nor as a mere "resource" but as a dynamic, lively, and unruly entity. By learning to "think like a delta" (Knox 2020), we can better understand the complex interrelations of deltaic processes, human practices, and non-human entities in the making and unmaking of the delta.

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CHAPTER 4

Other-than-Human Affective Relationalities:

Camels, Mangroves, and Saltwater Intrusion in the Indus Delta of Pakistan

Introduction

During a summer in 2021, I met with a Jat, a former camel herder turned fisherman and community leader in the village of Haji Muhammad Siddique Jat, situated in the Indus Delta of Pakistan. We met at a workshop organized by a conservation non-governmental organization (NGO) in Keti Bunder. Tajan belongs from the Fakarni Jat community, renowned for their deep-rooted understanding of camels, often regarded as unparalleled in South Asia (Westphal and Westphal, 1964). Despite this expertise, Tajan, like numerous other Jats, has relinquished camel husbandry to pursue fishing activities, a shift propelled by the environmental degradation plaguing the Indus Delta region. Assuming the role of the community-based organization's (CBO) President for his village, Tajan articulated pressing challenges faced by his community, especially prohibitions on camel browsing enforced by the Sindh Forest Department (SFD), the escalating threat of soil erosion stemming from saltwater incursion imperiling their settlement, and issues about access to potable water, among other concerns. Amidst a hiatus, Tajan and I ventured outside for a smoke, engaging in a conversation that spanned topics related to the delta's evolution, the symbiotic relationship between camels and mangroves, and the contentious allegation of camels and their grazers being responsible

for mangrove destruction within the Indus Delta. In response to my query regarding these allegations, Tajan responded with a smile punctuated with a sense of serenity and proceeded to recite a verse from the poetry of Shah Abdul Latif Bhattai, a revered 19th-century Sufi mystic poet from Sindh:

معلم ميڙيو خبرون اوريان ئي آڙين
ساڪا سوڌ نه ڏيئن جتي وهه ويڌ ڪري
(سر سامونڊي - شاهه عبدالطيرف ڀٽائي)

Everyone is bringing the news from the shore only
Nobody is bringing the news where waters are deep and waves are high
(Shah Abdul Latif Bhattai)

Tajan evoked the poem to underscore the inadequate and sporadic knowledge displayed by governance organizations concerning the sea, the river, mangroves, and camels, encapsulating their limited grasp of the intricacies of the delta. He expressed his dissatisfaction and adamantly remarked, "These individuals [from NGOs] possess minimal knowledge about the delta and tend to focus on peripheral matters. Do they ever consider camel's love for the tamer plant?" I requested him to elaborate. Tajan clarified, "Are you unaware that camels only eat *tamer* (*Avicennia marina*)?" Employing this assertion to challenge my understanding, he continued, "In our delta region, *tamer* was abandoned, and camels consume only *tamer*. Why would we or our camels destroy *Tamer*?"

The Sindh Forest Department, conservation groups, and environmental NGOs—heretofore referred to as governance organizations—are actively engaged in the preservation and reforestation of mangroves to combat the adverse effects of saltwater encroachment in the Indus Delta. Notably, the significance of mangroves has escalated

manifold due to their pivotal role in carbon sequestration, offering the potential to generate substantial revenue through carbon trading (World Bank, 2021). These governance entities are not solely focusing on the cultivation of tamer plants but have introduced a variety of mangrove species sourced from the Balochistan coast, such as *Rhizophora mucronata* and *Aegiceras corniculatum*, under the guise of enhancing "mangrove biodiversity." A notable concern for these organizations is animal grazing, particularly by camels, which they perceive as a significant challenge impeding their efforts in mangrove conservation.

However, camels and Jats do not consider lesser-known mangrove species. On that particular day, when Tajan informed me about the camel's affection for the tamer, he also mentioned that camels do not eat other mangrove species, such as *Rhizophora*. Interestingly, Jats do not possess a native name for these species and instead refer to them as *Rhizophora* or even *engreezi* tamer (meaning "English mangrove") to signify their foreign origins. Later, approximately a month into my fieldwork, I inquired with other Jats about how we could conserve mangroves and whether camels were detrimental to their well-being, as asserted by governance organizations. They responded, "One cannot prioritize the preservation of one entity over the other. In fact, the tamer cannot be preserved without camels, and camels cannot survive without the tamer. The delta can only be saved if we allow the Indus River to flow freely, and the mangroves can only be preserved if we allow the coexistence of camels." In other words, camels and mangroves are intricately interconnected within the deltaic ecology, and their relationality shapes Jats' lifeways.

Nevertheless, this does not imply that the ongoing efforts to conserve mangroves are ineffectual. Mangroves in the Indus Delta are expanding in terms of their coverage. However, local communities do not regard these recently planted mangroves as genuine mangroves. They claim that these mangroves lack strength, height, and the distinct scent that entices both humans and camels. Furthermore, our camels are currently weaker and prone to illness, while the taste and texture of camel milk have also changed, Jats said.

Following contesting narratives around mangroves and camels, I propose a conservation approach focusing on intimate relationality among species rather than species. I adopt a speculative perspective, aiming to go beyond a mere critique of existing models and envision alternative conservation methods. Drawing inspiration from Kohn (2022) and de la Bellasaca (2017), speculative conservation does not seek to establish a definitive model or description but rather explores alternative approaches to conservation informed by ethnography and nonwestern knowledge or other means. This approach aims to broaden conservation practices and envision a more inclusive and sustainable future amidst the ongoing biodiversity loss and the sixth mass extinction (DePuy et al. 2021; Kolbert 2014).

Govindrajan (2018), in her recent book "Animal Intimacies: Interspecies Relatedness in India's Central Himalayas," highlights nonhuman intimacies. For instance, she recounts the story of a cow named Gauri who would refuse to eat and vocalize distress when her companion cow, Sharmili, was sold and removed from their home. This deep friendship compelled the owner to bring Sharmili back and reunite her with Gauri. Similarly, local communities narrate the complex and often violent relationship between tigers and dogs, connecting it to the intertwined destinies of both species. However,

Govindrajan's ethnography primarily focuses on elucidating the interconnectedness between humans and animals through acts of care, kinship, love, violence, politics, indifference, and desire. Inspired by her work and that of others, I aim to make evident the emerging nonhuman intimate relationality and its possible role in conservation.

Nonhuman intimacies, I argue in this chapter, should not be disregarded as mere coincidences; rather, they are significant as they allow us to conceive of conservation in alternative ways (Govindrajan 2018; Archambault 2016). Moreover, by following the intimate relationship between camels and mangroves, I propose a conservation practice that shifts its focus from species-level conservation to a more context-specific examination of intimate relationality among various beings. The concept of "species" (Wilkins 2009) and thus "species conservation" is a Western construct that largely centers around species while disregarding the broader historical and intimate relations that species develop and sustain within their ecological context. In this chapter, I advocate for shifting the focus towards a more situated understanding of intimate relationality among species, which emerges through “historical and chance encounters” (Kirksey 2015). In the current era of global biodiversity loss, it is crucial to transcend the Western conceptualization of conservation.

Furthermore, adopting a conservation practice centered on intimate relations would enrich the ongoing efforts of multispecies conservation, which has successfully demonstrated the intricate interconnectedness between humans and other-than-human beings (Aisher and Damodaran 2006). For the purpose of intimate relational conservation practice, I draw on ethnographic research with mangroves, camels, and Jats of the Indus Delta. For these Muslim Jats, who rear camels, camels and mangroves are not perceived

as distinct species in the Western sense of the term (Wilkins 2009), nor are they considered "persons" as other nonwestern Indigenous societies might conceptualize other-than-human beings (Viveiors de Castro 1998; Descola 2013; Kohn 2013; *David-Bird 1999*). Instead, camels and mangroves are viewed as other-than-human "beings," created by God and possessing a soul. In Islamic cosmology, the notion of Ashraf-ul-Mukhluqat is relevant, which posits that humans are superior beings among God's creations (Ashraf = superior + Mukhluqat = beings) (Manzoor 2003). However, this superiority does not grant humans mastery over other beings as Western cosmology suggests. Rather, it entails greater ethical responsibility for humans (Manzoor 2003). Humans are entangled in a web of relations with other-than-human beings and must respect this relationship carefully. The Jats, being Muslims, adhere to this cosmology and value the relationship between mangroves and camels.

Literature Review

This chapter discusses debates from ontological anthropology and multispecies ethnography to elaborate a distinctive account of conservation practice that focuses on intimate relationality among beings. The chapter follows the provocation by Anna Tsing (2019), who asks, “Must all relations begin and end with humans?” (Tsing 2019, 223). I propose a relation that begins and ends with nonhumans and speculates what such relations can teach us about conservation.

Political ecology scholars have shown the politics of conservation (West 2006). Other scholars who work at the interface of political ecology and the politics of knowledge have explored what happens when different knowledge-making practices come into contact, making visible the ways Indigenous knowledge is “lost in translation”

when dominant scientific Western concepts try to make sense of them (Brosius 2009). Scholars have argued that when "environmental anthropologists [in an] attempt to make conservationists understand and value the local knowledge translate it into categories that scientists can easily understand and assimilate into their epistemologies" (West 2005, 632), they allow the "western concepts and modes of explanation to dominate" (West 2005, 633; see also Broisus 2006; Nadasday 2007). Political ecology, thus, foregrounds the discursive practices and contesting discourses in making and unmaking the environment and foregrounds the politics of conservation. However, ontological anthropology goes beyond the politics of discourse, showing that environmental conflicts are ontological.

Ontological Anthropology

Ontological anthropology (OA) begins by accepting the proposition that "ethnographic descriptions, like all cultural translations, necessarily involve an element of transformation or even disfiguration" (Holbraad et al. 2014). For OA, then, the question is what to do about "disjuncture communication," which is not only linguistic (discourse, epistemological) but also happens when two interlocutors are talking about the same thing but evoking completely different worlds (ontological) (de la Cadena 2015; Viveiros de Castro 1998). For example, as we see below in detail, western cosmology, which rests on the division of nature and culture, is a metaphysics that goes beyond language and manifests nature and beings and things in nature as passive and inert. This also shapes our relations with beings and things, paving the way for conceptualizing them as a resource only (Shiva 2010). Other non-Western Indigenous people might not conceptualize nature as passive. Even for them, the concept of nature might not exist as it

is rendered visible in Western cosmology. Thus, OA asks, will it be possible to make sense of non-Western concepts or cosmology through the lens of Western cosmology? (Holbraad and Pedersen 2017; Descola 2013; Viveiros de Castro 1998). In asking this critical question, they point to the "inadequacy" (Holbraad 2010) and "thin[ness]" (Strathern 2020, 35) of certain concepts in making sense of worlds other than the Western. Ontological anthropology argues that concepts have the power to foreclose the possibility of non-western practices and lifeways (de Castro 1998; Descola 2013). In its simplest rendition, ontological anthropology argues that concepts at our disposal are Western, which have limitations in making sense of the concepts, and thus the worlds, of non-Western people.

The roots of ontological discussion in anthropology go back to the works of Marilyn Strathern. While not explicitly labeling her work as ontological, her provocation that "it matters what concepts we use to think other concepts with" (Strathern 1992) has become the mantra for ontological anthropology. She shows how concepts like nature and culture (Strathern 1980) and society and gender (Strathern 1988) were applied to Melanesian life. It is as if an existing conceptual grid was at hand, and scholars placed different Melanesian practices and everyday activities in it. Following on her earlier works, she has more recently thoroughly interrogated the concept of relations as rendered in anthropology. Strathern (2020) argues that relations in the English-speaking world are conceptualized only regarding kinspersons. She argues, "When anthropologists talk about relations, it is persons who most often come first to mind…" (Strathern 2020, 11). This has implications, as shown by Anna Tsing (2014), who notes how she has been restrained in exploring nonhuman sociality or "the social relations that do not come into being

because of humans" (Tsing 2014, 27). If "social means made in entangling relations with significant others," she notes, then "clearly living beings other than humans are fully social—with or without humans" (27). Viveiros de Castro illuminates "how alien to nature…are these relations", which are thought to "exist internal to human society" only (1998, 473). These interpersonal relations, argues, Pina-Cabral (2017), are a poor analogy for the more general condition of being-in-relation (175-76). If such narrowly construed social relations are a bad analogy, then for ontological anthropology the question is, "what comes after the [social] relations?" (Holbraad and Pedersen 2017, chapter 6), by which they mean, what kind of relations nondualist (nonwestern) cosmologies foreground.

Various ontologically informed scholars have made visible relations that emerge in nondualist, nonwestern cosmologies. A prominent ontological anthropologist, Viveiros de Castro, elucidates the non-Western cosmology following South American Indigenous peoples' "perspectivism." The theory elaborates that animals see themselves as persons because all beings have human-like souls and are "subjects" (de Castro 1998, 2015). It is, instead, differences in bodily form that change the things that beings see. For example, a person with a human body will see manioc beer as beer and blood as blood. However, because their bodies differ from humans', jaguars see blood as manioc beer (Viveiors de Castro 1998). But both humans and jaguars see and have points of view on things; thus, both are subjects. He argues that it is impossible to make sense of the Amerindian world through the Western concept of "multiculturalism," which reduces the Amerindian world to mere cultural views (a different epistemology). This forecloses the reality of jaguars as

subjects who see blood as manioc beer to manifest itself, thus foreclosing Indigenous practices and relations with jaguars, as with many other beings.

He proposes the concept of "multinaturalism," in which culture is singular and possessed by all beings (all beings have worldviews). Still, nature is multiple (the things/entities in the world beings see are different) (Viveiros de Castro 1998, 2014). Through "multinaturalism", de Castro challenges the Western nature-culture dualism, in which nonhumans always emerge as passive, inert, and without a point of view. He also challenges the anthropological practice of cultural comparison, showing the limitations of anthropological concepts and cosmologies.

Philipe Descola (2013), another prominent ontological anthropologist, also demonstrates that the nature-culture dualism is not universal but Eurocentric ontology. For him, there are multiple ontologies, and giving dominance of one ontology over another will lead to egregious anthropological knowledge production, or in other words, would lead to misunderstanding in the culture. For example, naturalist ontology that is Eurocentric views the dominancy of culture (humans) over nature (other-than-humans). However, in other ontologies, such as animists, the distinction between nature and culture is impossible. Thus, he argues, it is impossible to comprehend animist ontology by comparing it to naturalist ontology and vice versa. He surveys ethnographic literature from across the world in his multiple ontological schemes. He provides us with four ontological schemas based on how different societies conceptualize the interiorities and exteriorities (physicality) of beings. Naturalists based on dualist metaphysics view the same exteriority (body) but different interiority; animists are opposite to naturalists and see different exteriority (body) but the same interiority of all beings. Totemistic societies

view both interiority and exteriority as the same, while for Analogism, both interiority and exteriority of beings are different.

Eduardo Kohn (2013, 2007), following the OT framework, shows the limitation of the human form of language and in so doing, makes visible "a broader series of forms of communication that are representational but not language-like, and whose unique properties emerge ethnographically at the same time as they reveal what makes human language special" (Kohn 2015, 314) but not the only form of communication. Working with the Runa people of Ecuador's Upper Amazon and employing Charles Peirce's semiosis, he invites us to imagine how forests - through the many kinds of beings that people the forests – think (Kohn 2013). Forests are full of communicative but not language-like signs. Humans and nonhuman beings exploit those signs to understand and navigate their lives in the forest. Thus, in discerning thinking forests, he allows the biological beings and processes to "speak" and explores how the Runa people of the village of Ávila make sense of such "speaking," which is not human-like. He argues this "is crucial for anthropology because it reveals how so many of our conceptual assumptions (e.g., about difference, context, relationality, and commensurability) are drawn from [human] language and its properties . . ." (Kohn 2015, 315), which may limit the varieties of ways relations can be done. Kohn's work represents a conceptual effort to take "Anthropology beyond the human" to the "anthropology of life." Such an anthropology does not centralize the "human" but instead provides an opening for understanding how we humans have been forced to relate with the other-than-human beings who do not share the same characteristics as us (Kohn 2013, 2014).

These and other ontological projects argue for "provincializing" (Chakrabarty 2000) Western cosmologies of nature-culture dualism, deconstructing the anthropocentric view of the world, showing how worlds in which humans and nonhumans participate equally are enacted, and making visible the world of many worlds (Latour 1993; Stenger 2011; Pedersen 2011; Blaser and de la Cadena 2018; Escobar 2016; Povinelli 2016). Although ontological anthropology has faced a sustained critique[1], it provides us with a framework to make visible and critique dominant Western concepts and practices and invites us to imagine a different future informed by non-Western ways of worldling.

Multispecies Ethnography

If ontological anthropology emerges from Indigenous conceptualizations of beings and things in the world and allows us to perceive relations with the world via non-Western cosmologies, the emergent field of multispecies ethnography enables us to understand these relations in more-than-human terms. Previous anthropocentric studies by scholars such as Geertz, Levi-Strauss, Marvin Harris, and others on nonhumans in anthropology focused on studying nonhumans within the context of symbols, religion, kinship, and exchange. However, multispecies ethnography takes a different approach, placing other-than-human beings as protagonists in the narratives of worldmaking. By reframing the questions and giving agency to other-than-human beings, multispecies ethnography reveals the myriad ways in which other-than-human beings shape the world (Kirksey and Helmreich 2010; Van Dooren et al. 2016).

Multispecies ethnography has two important objectives: first, to imagine what it means to be human in interspecies relations, thus questioning human exceptionalism (Haraway 2008). Secondly, sociality should be broadened to include other beings (Tsing

2014). In other words, when Anna Tsing (2012) proclaimed that human nature is an interspecies relationship, she invites us to envision "social relations that do not come into being solely because of humans" (Tsing 2014, 27). In her ethnography on Matsutake, a rare kind of mushroom, Tsing (2015) highlights the sociality of mushrooms, which emerge not only due to humans but also involves fungi, pine trees, fire, and numerous other nonhuman actors that contribute to the growth of Matsutake.

Similarly, when Donna Haraway (2008) asks, "whom and what do I touch when I touch my dog" (03), she urges the reader to sense the "agility" of species when they interact in "contact zones" (35). She argues that humans and animals "become-with" as "companion species" (Haraway 2008) or as "unloved others" (Rose and van Dooren 2012) when they meet. In other words, she presents a different relationality that does not position humans as central actors but as just one among various beings involved in world-making. Raffles (2002) demonstrates the collaborative effort of humans and nonhumans in the formation of the Amazonian village Igarape Guariba. He argues that "place-making" in Amazonia is never solely a human affair but always an "entanglement" of humans and nonhumans. It is, in the words of Fuentes (2010), a "natureculture entanglement," rather than solely culture acting upon nature, as is often assumed.

Other scholars turn to other-than-human beings as "agents". De Carvalho Cabral (2015) recounts how leaf-eating ants in Brazil thwarted European colonial efforts to establish plantations because the colonizers were unaware of how to manage these ants. Through this example, de Carvalho Cabral demonstrates not only the ants' agency in Brazil's agricultural context but also debunks the colonial myth of New World lands as lifeless. Paxson (2008) further tells a fascinating story of microbes that aid in cheese-

making, thereby narrating a relational world in which plants, animals, family members, employees, and consumers come together to create cheese culture in America. Van Dooren's (2014) narrative explores the story of penguins, who imbue breeding places with historical and meaningful significance for themselves.

By paying closer attention to the interacting agencies of humans and other-than-humans as they shape each other (Paxson 2008; Kirksey and Helmreich 2010; Kohn 2013; Tsing 2015), multispecies ethnography illuminates "diverse ways of life that constitute the world" (Van Dooren et al. 2016, 02). Thus, multispecies ethnography attends to the "contact zones" of heterogeneous beings across the scale, where the intimate relationalities of beings assemble to become-with each other (Haraway 2008, 35; Tsing 2015).

Multispecies ethnography is reshaping conservation practices by placing other-than-human beings and relationality at the center (Aisher and Damodaran 2006). Scholars advocate for considering nonhuman beings as active agents, participants, and protagonists who share intertwined histories and life worlds with humans (Munster 2016; Locke 2016), and for taking love seriously in the relations between human and nonhuman beings (Milton 2002; Munster 2016; Singh 2018; Archambault 2018). Other scholars are exploring the materiality of emotions, love, care, intimacy, and conviviality in conservation. Sultana (2011) argues that the co-production of people and places results from material endeavors and emotions. Moore et al. (2015), on the other hand, illustrate how school gardens provide opportunities for students to engage in "affective and playful labor" that fosters connections with nature and aids in learning and community building. Morales and Harris (2014) further reveal the co-emergent subjectivities of humans and

nonhumans by engaging with emotional geographies in the context of community-based environmental work. Other scholars have highlighted the importance of love and care for plants in urban contexts (Archambault 2016). Similar arguments are made by Hartigan Jr. (2020) in his study on wild horses in Spain, where he advocates for the incorporation of ethology, or the study of animal behavior, as a method (see also Hodgetts and Lorimer 2015). These and other scholars invite us to imagine conservation practices that transcend various dualisms such as nature and culture, animal and human, and natural and social sciences (Tsing 2014) to demonstrate the ways humans become-with (Haraway 2008) not in opposition to other beings but in relation to them. To appreciate more-than-human relationality also requires reconceptualizing other-than-human beings, as Eduardo Kohn argues,

> *"If we take otherness to be the privileged vantage from which we defamiliarize our 'nature,' we risk making our forays into the nonhuman a search for ever-stranger positions from which to carry out this project. Nature begins to function like an "exotic" culture. The goal in multi-species ethnography should not just be to give voice, agency, or subjectivity to the nonhuman—to recognize them as others, visible in their difference—but to force us to radically rethink these categories of our analysis as they pertain to all beings*" (Kohn 2010, cited in Kirksey and Helmreich 2010, 562-63).

Together, the ontological turn and multispecies ethnography are responses to the world's recent environmental crises. They challenge the Euro-American metaphysics of dualism. They accomplish this by encouraging us to envision a nondualist metaphysics in which the distinction between nature and culture appears arbitrary. Thus, they argue for the reassembly and reconceptualization of neglected entities and beings rather than simply explaining how the world has been produced by discursive practices (Puig de la Bellacasa 2017; Papadopoulos 2018). This speculative futuring aims to envision the

"pluriverse" (de la Cadena and Blaser 2018; Escobar 2018) by attending to the diverse ways of life, both Western and non-Western, living and nonliving, that constitute the world (Van Dooren et al. 2016), and by examining the ethical, cultural, and political implications and ontological significance of such worlding (Puig de la Bellacasa 2017).

Methodology

For this chapter, I participated in observation with camels and mangroves alongside Jats, the camel herders of the Indus Delta of Pakistan. I did participant observation[16] with the Jats. Traveling with jats and camels in the deltaic creeks and patches of mangrove forests gave me a rare understanding of the intimate relationship between camels and mangroves. I also conducted semi-structured interviews (n=31) with Jats males and females both in person and on the telephone. To deepen my understanding of the lives of *Kharai* camels in the Indus Delta, I thoroughly explored various websites. I delved into natural science articles relevant to the subject matter. These comprehensive research methods allowed me to capture a multifaceted understanding of the complex dynamics between camels, mangroves, and conservation efforts in the region.

To gain insights into the perspectives of conservation organizations regarding the relationship between camels and mangroves in the Indus Delta, I conducted field visits

[16] My fieldwork was significantly disrupted due to the pandemic's emergence, which led to widespread travel restrictions, lockdown measures, and the enforcement of social distancing protocols. Consequently, I was compelled to adapt my research methodologies, transitioning towards a greater reliance on digital ethnography methods (Pink et al., 2016). However, I was able to resume my ethnographic fieldwork within the Indus Delta region, specifically engaging with Sindhi fishers, camel herders, and governance officials, following the issuance of guidelines by the University of Georgia Institutional Review Board (UGA-IRB) pertaining to the creation of a research resumption plan (RRP). This RRP encompasses a comprehensive set of inquiries, protocols, and procedures aimed at facilitating ethical research practices and ensuring a safe research environment amidst the ongoing COVID-19 crisis. Adhering strictly to the RRP and guidelines laid out by the World Health Organization, I conducted participant observation by maintaining a safe physical distance, wearing protective face masks, and observing village gatherings from a cautious distance.

with officials from the Sindh Forest Department and WWF-Pakistan, both significant stakeholders in mangrove conservation efforts in the region. During these visits, I engaged in 12 semi-structured and key informant interviews with these organizations' directors, managers, and field officers, focusing specifically on the interaction between camels and mangroves. Additionally, I participated in various meetings attended by members of the Jat community, where I observed how conservation organizations addressed camel browsing as a challenge within their mangrove conservation strategies and how the Jats articulated their concerns during these discussions. Moreover, I extensively reviewed grey literature comprising reports, proposals, and evaluations from conservation organizations to gain further insights into their perspectives.

The term "*Kharai*" translates to "salty." The camels found in the Indus Delta region are called *Kharai* camels (*Camelus dromedarius*) due to their adaptation to the salty ecosystem of the delta. These camels, characterized by their short stature and single hump, are renowned for their ability to travel up to 10 nautical miles to reach the mangrove forests, earning them the nickname "swimming camels" of the delta. According to Westphal and Westphal (1964), camels were introduced to present-day Pakistan from Arabia around 500 BC and subsequently spread throughout India and the region.

The Jat tribe is divided into locally called *Orak clans of* different household sizes, such as Malakani, Fakirani, and Lakhani. These clans are patrilineal groups controlled by a headman called *Wadero.* These headmen further come under the *Malik*, who is said to be the headman of all Jat clans. Of these groups of Jats, Fakirani Jats is known to be the best camel herder throughout South Asia (Westphal and Westphal 1964) whom this

research is conducted. They are also known as Sanwelani Jats, deriving their name from their ancestor, who is now revered as a saint. His shrine is now in present-day Cutch in India, where an annual pilgrimage, locally called Urs, is celebrated every year. Since the partition of India, the Fakirani Jats of Pakistan cannot go to India. They have constructed a symbolic shrine at the border to celebrate the *Urs.* During *Urs,* people sing local songs, dance around the shrine, and at the end, they offer a boat full of sweets to the saint, throwing it in the water.

Fakirani Jats have lived and maintained a nomadic life in the Indus Delta. During the winter, when the delta's Indus River flow was low, Jats would migrate to the inland forests of Thatta, Jati, and Badin districts for 3 to 4 months. Their camels can graze on different local plants. During the summer months, camels roamed the mangrove forests. Being the people of "wilderness," they maintained a very isolated life and practiced strict endogamy. In fact, until recently, they have strictly rejected all kinds of agricultural practices, completely relying on camel herding. However, during the British colonial period, attempts were made to settle the Jats by allocating land to them within the mangrove forests. Despite this offer, the Jats declined, unwilling to abandon their traditional way of life and fearing previous landowners' permanent bans on camel grazing (Memon and Thapa 2011). In the past, their only diet was camel milk, and they ate it for months without any other food supplement. They call camel milk a complete diet and sometimes use it as medicine.

However, as the delta's mangroves progressively degraded due to altered river flow caused by extensive upstream irrigation infrastructure, the Jats were compelled to abandon their nomadic lifestyle. According to Sindh Forest Department officials, the loss

of mangroves, once spanning between 300,000 to 600,000 hectares, has been reduced to less than 50,000 hectares. This degradation reduced the camel fodder significantly. Moreover, the altered flow of the river has significantly impacted the availability of sweet water for camels, as historically abundant sources have dwindled due to altered river flow. Consequently, Jats must transport sweet water by boat from upstream every 3 to 4 days, a costly and hazardous endeavor. These challenging circumstances have led the Jats and their camels to settle in permanent villages along the banks of the delta, marking a significant departure from their traditional nomadic existence.

The Historical Ecology of Mangroves of the Indus Delta

Mangroves thrive in areas where other plant species struggle to grow. These unique ecosystems consist of halophytic plants, known as mangroves, with a remarkable tolerance to high salinity levels. They typically inhabit intertidal shorelines along tropical and subtropical coasts (Woodroffe et al., 2016). Mangroves require muddy substrates regularly inundated by tides, although different species have varying tolerance levels to tidal inundation (McKee et al., 2012).

Despite their salt tolerance, mangroves in riverine environments like those found in the Indus Delta rely on the flow of fresh river water and sedimentation for their survival (Woodroffe et al., 2016). The mangrove ecosystem supports diverse marine and terrestrial species, providing crucial habitats for coastal communities, particularly fishermen and farmers who rely on these ecosystems for their livelihoods. Mangroves are often called "natural barriers" against saltwater intrusion, protecting against storms, high tides, and coastal erosion (Woodroffe et al., 2016).

Stretching along the 240-kilometer Sindh coastline, the Indus Delta ranks sixth largest globally and historically harbored eight distinct mangrove species (Blatter et al., 1929). However, today, only four species remain *Aegiceras corniculatum, Ceriops tagal, Avicennia marina (Tamer), and Rhizophora mucronate.* The decline of the other four species can be attributed primarily to the altered flow of the Indus River into the delta. Currently, only *Avicennia marina* and *Rhizophora mucronate* thrive, while the other two species are on the verge of extinction (WWF-2018).

Historically, in the central section of the Sindh coastline where this study is situated, the predominant species was *Avicennia marina*, accounting for over 90% of the mangrove forest (Meynell and Qureshi, 1993; Sindh Forest Department). *Rhizophora and Aegiceras* originate from the coastal belt of Baluchistan, the western province of Pakistan, and were introduced to this part of the Indus Delta during the 1980s with the aim of augmenting mangrove "biodiversity." They comprise 8% and 1.5% of mangrove cover, respectively.

Among the myriad threats facing the mangroves of the Indus Delta, the altered flow of the Indus River stands out as the most pressing concern. In its pre-dam state, the Indus River would carry over 100 million acres of water (MAF) annually, transporting more than 270 metric tons (Mt) of sediment to its delta. However, the construction of British colonial irrigation infrastructures and their continual expansion in postcolonial Pakistan has drastically reduced the river flow to less than 10 MAF, resulting in a sediment transport rate of approximately 13 Mt per year. Consequently, the number of active deltaic creeks and channels has plummeted from 17 in 1861 to just one significant channel by 2000 (Syvitski et al., 2013). This diminished fluvial flow has exacerbated

saltwater intrusion in the delta, leading to the alteration of a staggering 25% of the delta area due to erosion, while only 7% of the new delta area has been formed through accretion (Syvitski et al., 2013; Ferrier et al., 2015). This alteration poses a significant threat to mangrove forests, as they thrive at the sea's edge, serving as the first line of defense against saltwater intrusion and the primary victims of such intrusion (Woodroffe et al., 2016).

Governance organizations have implemented various strategies to conserve mangroves by recognizing the decline of mangroves and the challenges in restoring pre-dam flow conditions due to dwindling water resources and the complexities of water-sharing politics in Pakistan. Mangrove forests were designated as "protected forests" in 1957 under the Forest Act of 1927, and in 2002, they were declared a Ramsar site of international importance. This designation restricted the cutting of mangroves, allowing local communities to utilize them for domestic purposes such as fuel. In response to the declining mangrove area, the Sindh Forest officials initiated "scientific management" practices, including assisted natural regeneration, artificial regeneration of suitable species, and large-scale plantation efforts starting from the 1980s. However, despite over three decades of management and conservation efforts, the mangrove area dwindled from over 300,000 hectares to a mere 40,000 hectares by the late 1990s, prompting alarm among government officials (WWF, 2012).

Subsequently, a series of mangrove conservation programs were launched in the early 2000s, encompassing plantation initiatives, community mobilization, education campaigns highlighting the benefits of mangroves, job creation opportunities, and the appointment of local individuals as "eco-guards" to protect mangrove areas. Today,

mangrove forests have expanded to cover 140,000 hectares—an achievement often touted by officials as one of the few success stories in global mangrove conservation efforts. Animal grazing and browsing, especially camel browsing, is seen as the greater threat to their conservation practices.

Camel and *Tamer* Intimate Relationality

One early morning, following breakfast, I embarked on a journey alongside Tajan Jat, the President of a Community-Based Organization (CBO) in the village of Haji Muhammad Jat, along with Umer Jat, a 45-year-old camel grazer, and Sain Muhammad Jat, a schoolteacher and the son of a former camel grazer. We set sail in a boat together to spend a night amidst the mangroves with our camels. Our voyage took us nearly two hours aboard a motorboat until we reached the Chann Creek Tamer Forest. Along the journey, my companions recounted tales of old times, reminiscing about the villages that once stood where we now traversed, lamenting the encroachment of saltwater that now dictated our mode of transportation. Beneath the tranquil waters, I pondered and inscribed in my diary lay vestiges of bygone villages, sacred resting places, and poignant memories.

Within the span of two hours, before noon, we reached Chann Creek, and Tamer forests were visible from a distance. As our vessel drew nearer, I spotted several camels leisurely grazing amidst the mangroves, while others rested. Standing by were two Jats, entrusted with the care of these majestic creatures, awaiting our arrival. After exchanging warm greetings, we proceeded to disembark our boat, securing it to a sturdy tamer tree, before proceeding barefoot onto the shore, en route to the lush forest canopy. Stretching before us lay an assembly of over 200 camels, recently translocated to this locale merely

a week prior from forests accessible via a 3- to 4-hour boat voyage. The Jats rotate the camels from one patch of forest to another, thereby averting overgrazing and facilitating habitat rejuvenation. Moreover, they exercise utmost caution to refrain from grazing the camels amidst burgeoning mangrove saplings, recognizing the imperative of preserving these vital ecosystems for future generations.

Amidst jovial laughter, I attentively absorbed their conversation. One of the Jats asked me whether I wanted to taste camel's milk, an experience I had yet to encounter. I accepted with some inner joy to experience the taste of camel milk. Tajan told me that this milk is very healthy and will keep various diseases away from your body. The milk was thinner and tasted slightly sour compared to buffalo milk. One of the Jats reminisced nostalgically about a bygone era when camel's milk served as a dietary staple, recounting an era when illness was a rare occurrence, attributed to the wholesome nourishment derived from this esteemed elixir. Indeed, he recounted a time when camel's milk constituted the primary sustenance, savored threefold daily, occasionally accompanied by bread or rice.

However, amidst this discourse on the virtues of camel's milk, another Jat interjected with a sobering observation. With a wistful tone, he lamented the apparent decline in the quality of camel's milk, attributing this phenomenon to the changing nature of the camels themselves. Intrigued by this assertion, I paused mid-sip, prompting him to elucidate further. He elaborated on the transformation undergone by the camels over time due to changes in the mangroves. Mangroves have changed due to the altered flow of the river. This intrigued me, and I requested him to elaborate further.

Another Jat interjected and said, “Try to understand; everything in the delta is intertwined. *Tamer* needs freshwater and sediments. You did not see those taller, greener, and bigger *Tamer* trees”. He reminisced with nostalgia and said, “These forests were visible from a distance and would guide fishers on their return. And no one grew these forests. We never planted any trees. They all grew *qudarti* (natural). Why are today’s plants not taller, stronger, and smell as they used to? He asked me”. I replied I do not know with a nodding head. He went on, “Because of the Indus River. Its sweet water turns everything sweet and stronger. And then those stronger and sweeter mangroves would make our camels stronger. Our camels would rarely fall ill. You know, another Jat interrupted, if our camels get hurt, like small cuts on his body, or even if we had small cuts, camel milk was the best antiseptic medicine to heal those wounds”.

Conservation organizations perceive animal browsing as harmful to mangrove ecosystems. They advocate for restrictions on animal grazing, particularly camel browsing. This view of conservation organization is informed by the Western ontology of separation. They perceive beings and entities as separate, i.e., the separation of humans (Jats) and animals (camels) and the further separation of animals (Camels) and plants (mangroves). Current conservation practices are informed by the global narratives of climate change and biodiversity loss and focus on mangroves only[17]. On the other hand, the Jat's worldview sees camels and Tamer as relationally, thus inseparable, viewing the preservation of mangroves as inherently linked to the presence of camels and vice versa. For the Jats, the symbiotic relationship between camels and tamers transcends mere practicality; it is ingrained as an ontological reality.

[17] Please see chapter 01 for the detailed discussion of conservation politics in the Indus Delta.

These two different ontologies force us to ask, "What do people consider relations to be? And what counts as relations?" (Strathern 2018, 28). Marilyn Strathern recently examined the historical trajectory of the concept of relation in Anglophone thought (Strathern 2020, 3). She argues that relation is conceptualized primarily in terms of kinship in the English-speaking world. This has unstated ethical implications, as it limits the concept of relation to humans only, even when they form connections with nonhumans. Strathern notes, "When anthropologists talk about relations, it is persons who most often come first to mind…" (Strathern 2020, 11). However, she draws attention to recent works of posthumanism, which highlight the relations between humans and nonhumans (Strathern 2020). As a result, social sciences have been slow to engage with the relationality or sociality of nonhumans, "the social relations that do not come into being because of humans" only (Tsing 2013, 27). However, as Viveiros de Castro notes, these relations are considered "alien to nature" which are thought to "exist only within human society" (1998, 473).

The camel's intimate relationship with its tamer can only become evident if we pay attention to and appreciate nonhuman sociality. Anna Tsing (2013) argues that if "social means made in entangling relations with significant others," then clearly living beings other than humans are fully social—with or without humans (27). She suggests that such sociality is an "emergent effect of encounters" in which "gatherings sometimes become happenings" (Tsing 2015, 23). The camel's intimate relationship with *Tamer* is a form of sociality that emerges from historical and chance encounters in the rugged landscape of the Indus Delta (Kirksey et al. 2013; Kirksey 2015). It is within this

relational intertwinement that the intricate tapestry of sociality unfolds, revealing the profound interdependence between beings and entities.

Whereas *Tamer* helps camels to be stronger and keep diseases away, as argued above, the camels, in return, help *Tamer* to grow. Camels make the lands the mangroves need to grow; they trim the leaves of the mangroves, fostering regeneration; and they help spread *tamer* seeds and push the fallen seeds into the land, helping them take root. Finally, camel dung is said to be a natural fertilizer, giving strength to land and seeds to grow. Below, I unpack each of these affective works of camels for mangroves.

Camels play a role in shaping the terrain for the tamer. Upon learning that a few herders had relocated their camels from a distant island to one near Keti Bunder, I approached Hajan Jat to propose a visit to the location. We embarked on the journey in a boat in the early afternoon of the next day. I observed diminutive mangroves in the vicinity. Inquiring about their origins, I queried whether they were newly planted mangroves, as conservation bodies typically prohibit Jats from grazing on newly established mangrove areas. The response was contrary; they clarified that these mangroves were aged but had failed to thrive. When prompted for an explanation, they attributed the stunted growth to the unyielding surface beneath. Urged to disembark from the boat and traverse the area on foot, I complied, finding the water levels shallow, barely reaching above my ankles. Walking on the surface, I discerned the hardness beneath my feet, impeding any sinking into the mud as typically encountered in other mangrove settings. As the camel herds traverse these muddy and compact tracts of land with their substantial weight and broad padded hooves, they gradually ameliorate the firmness of the terrain. The Jats shared an anecdote attesting to their practice of leading camels to

areas characterized by rigid ground, allowing them to roam and frolic in these locations, with the natural course of events subsequently facilitating land softening.

Camels engage in the meticulous trimming of mangrove leaves, a practice that aids in rejuvenating these vital ecosystems. Grazing on the leaves of the tamer plant, camels exhibit a distinctive dietary preference that excludes the consumption of roots or the uprooting of the plant. Instead, they delicately prune the leaves of the tamer. This selective feeding method has been observed to stimulate the mangroves to generate fresh leaves, subsequently fostering the growth of *karee* and flowers. According to the insights shared by the Jats, camels' presence is integral to tamer vegetation's vertical development. Notably, the Jats do not classify newly planted *Tamer* as an authentic *Tamer*, citing deficiencies in height, verdancy, and aromatic essence that are characteristic of the plant in its mature state.

Camels also play a crucial role in aiding the dispersion and embedding of *Tamer* seeds into the soil. As camels consume *Tamer* leaves, seeds are released onto the ground. Subsequently, these seeds are carried by waves to distant locations, where they may find suitable conditions to germinate and thrive. Additionally, certain seeds adhere to the camels' bodies, falling off as the camels move through the forest, thus facilitating seed dispersal and accumulation on the ground. Furthermore, camels contribute to burying these seeds within the muddy terrain through trampling actions. Pushing the seeds into the soil enhances their prospects of germination and growth. Notably, Jats believe that camel dung is a potent natural fertilizer, augmenting tamer seeds' growth rate and resilience.

However, the symbiotic relationship between camels and *Tamer* transcends these ecological contributions. Rather, their relationship is informed by what Raffles (2002) terms "affective sociality", a dimension characterized by corporeal engagement and interconnectedness. This affective bond is primarily directed towards the *Tamer* plant. For instance, while camels exhibit an affinity for consuming *Tamer*, they exhibit a marked aversion towards *Rhizophora mucronata* and *Aegiceras corniculatum*, two other mangrove species introduced in the central region of the delta to enhance the ecological diversity of the mangrove habitat amidst their dwindling numbers.

A key aspect of the affective relationship between camels and the *Tamer* plant lies in the distinctive form that the *Tamer* assumes. According to Eduardo Kohn, "form" denotes "the particular manner in which configurations propagate in the world in ways that result in a sort of pattern" (Kohn 2013, 159). When planted, the roots of *Tamer* grow into the soil and spread out like soft tentacles emerging from the ground. With the roots evenly distributed and the tree trunks and branches high above, the *Tamer* Forest provides ample space for humans and camels to move around. "The soft roots that grow out provide a soft bed to sit on," said one Jat. Thus, camels can easily eat the flowers, fruit, and leaves of the *Tamer* while moving around and can readily find spaces to sit and rest within the tamer forest. This propagation of the *Tamer's* form in the world engenders diverse experiences, intricate structures of feelings, and profound intimacies with the

Tamer, as articulated by Raffles (2002, 182). Put simply, the "form efficacy" (Kohn 2013, 153) of the tamer plant is saturated with affective sociality enabling camels to forge deep affective intimacies with the plant.

Figure 4**.** The root configuration of *tamer* (*Source*: Author)

On the other hand, the form of *Rhizophora* contrasts sharply with *Tamer*. *Rhizophora* seedlings, once planted, undergo a prolonged period of two to three years to establish robust roots. The roots of mature *Rhizophora* grow from the stem and penetrate the soil, known as a loop-root plant, which grows like octopus tentacles from the stem and penetrates the soil from above (Batool et al. 2014), creating an intricate and complex network of roots. This root system obstructs the camel and human movement in the

forest. The form taken by mature *Rhizophora* impedes camels from cultivating a closely embodied relationship with it. One day, one of the Jats emphasized this when he asked me if I could hand him my pen and notebook. He drew the following diagram of *Rhizophora*, which shows the lack of embodied sociality of *Rhizophora.*

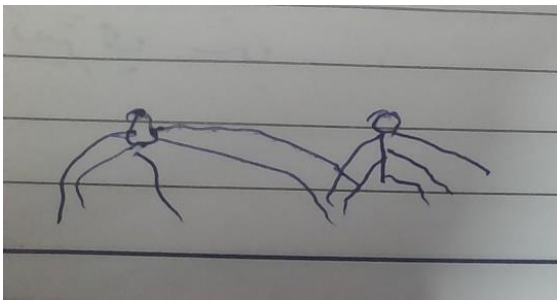

Figure 5**.** Hajan Jat's drawing of *Rhizophora* (Source: Author)

Figure 6. *Rhizophora* of near Keti Bunder (*Source:* Author)

Other than form, the taste of the plant is also salient in this affective relationality. The camels entice Tamer at various stages of its growth. During the summer, the yellow flowers, locally called *karee*, flourish in the tamer, emitting a potent sweet fragrance that allures the camels. This aromatic enticement drives the camels into a frenzied state, propelling them towards the *Tamer*. He elaborated on the camels' predilection for *karee*, asserting that it not only serves as a favored dietary choice for camels but also purportedly bolsters their physical resilience. By the onset of June, the *Tamer* yields fruits

referred to locally as *kumm*. Jats are cautious in regulating the camel's consumption of *kumm*, warning that excessive intake of this fruit, due to its heavy and indigestible nature in large quantities, poses a risk of ill health or even fatality for the camels. Furthermore, the consumption of *kumm* incites an increased demand for water by the camels. In earlier times, when the river's flow was consistent, ensuring an adequate fresh water supply was not an issue. Presently, the scarcity of freshwater pervades their surroundings, necessitating the procurement of sweet drinking water via boat from the riverbanks every few days at a substantial cost, running into thousands of rupees. Moreover, the camels' water consumption impedes their ability to swim, posing logistical challenges when transporting them between islands. Consequently, when the Jats endeavor to relocate their camels to another island, they deliberately restrict them from drinking water for at least one day before the voyage.

In contrast, *Rhizophora* fails to appeal to camels due to its bitter taste and lack of fruit. Efforts to entice camels towards Rhizophora plants demonstrate the strong antipathy camels harbor towards this species, with camels actively recoiling from the plant when presented with it. The camels' reluctance to engage with Rhizophora underscores their preference for and emotional attachment to the Tamer plant, as revealed through their poignant reactions when exposed to Rhizophora. This profound relationality with the *Tamer* necessitates the Jats to transcend material considerations, fostering a caring ethos beyond economic motives to safeguard the camel and *Tamer* interconnection.

As Anna Tsing noted, Camels engage in the "art of noticing," utilizing their senses of smell, touch, and taste to foster an intimate relationality with the *Tamer.* The *aromatic* allure of karee flowers produced by the tamer attracts both humans and camels from a

distance, prompting camels to gravitate toward it eagerly. Furthermore, the taste of *kumm*, as previously discussed, acts as a tempting treat for camels, driving their desire to consume it. The tamer's physical structure allows camels to experience tactile sensations by providing suitable spaces for movement, repose, and rest within the tamer forest. Presently, camels are spending increased durations in the mangrove forests, consuming *Tamer* throughout the year due to the dwindling conditions of inland forests. Today, only twenty thousand camels remain in the delta as compared to more than a hundred thousand in the past.

While governance bodies may view camels as a hindrance to mangrove conservation due to their browsing activities, Jats pose a fundamental query: If camels were detrimental to mangroves, how have these ecosystems thrived for centuries despite camel presence and grazing habits? This question underscores the intrinsic bond between camels and *Tamer* that transcends simplistic economic assessments, reflecting a profound interdependence shaped by historical contingencies and ecological co-evolution.

Conclusion

The concern raised by a Jat about the apparent neglect of camels in mangrove conservation efforts highlights a critical gap in existing conservation discourse within the Indus Delta. This sentiment urges a deeper examination of the central role that camels, in close association with their human caretakers, play in the ecological and cultural fabric of the region. While multispecies ethnography has extensively documented the significance of human-nonhuman relationships in conservation practices, there remains a relative lack of attention to the intimate relational dynamics between nonhuman species. In the case of the Indus Delta, the interactions between camels and mangroves form an essential yet

understudied component of conservation efforts. A more inclusive approach to conservation that accounts for these interspecies entanglements could provide a richer, more holistic understanding of ecological resilience and sustainability in the region.

Adopting a speculative approach inspired by De la Bellasaca's notion of speculative conservation, this proposal advocates for a fundamental shift in conservation practices that prioritizes preserving multispecies relationships rather than focusing solely on individual species or habitats. This reorientation marks a departure from conventional conservation paradigms, which often emphasize human-centered management strategies and rigid categorizations of nature. Instead, speculative conservation envisions a more fluid, relational approach that moves beyond the politics of predefined ecological concepts. This perspective acknowledges the entanglements between human and nonhuman actors and the dynamic, co-constitutive processes that shape ecosystems by embracing a broader understanding of interconnected life forms. In doing so, it challenges dominant frameworks and calls for a more imaginative, inclusive, and ethically attuned mode of conservation that recognizes the agency of all living beings.

Recent arguments by Aini et al. (2023) advocate for a reimagining of conservation practices that move away from outsider perspectives that critique local NGOs, instead emphasizing the need to understand and respect local approaches and work ethics in conservation. They highlight how certain activities, often dismissed as “leisure time” or even labeled as “laziness” in conservation discourse, were, in fact, crucial moments of engagement. During these idle periods, deep and meaningful conversations occurred between local NGOs and Indigenous communities, covering

essential topics such as fish catch patterns, sea weather conditions, reef health, and community well-being.

Similarly, to fully grasp the depth of nonhuman-to-nonhuman intimate relationality, it is crucial to recognize and respect the Jats' reverence for these interspecies connections. Their understanding of relationality extends beyond human involvement, challenging anthropocentric conservation models. This perspective aligns with Anna Tsing's insights into the multiplicity of relational origins, suggesting that conservation efforts must acknowledge and incorporate diverse ways of knowing and relating to the natural world. By embracing these localized, multispecies interactions, conservation can move towards a more holistic and inclusive framework that values the complexities of multispecies relationships.

The ongoing mangrove conservation efforts in the Indus Delta, largely shaped by Western conservation frameworks and centered on species preservation, risk overlooking the deep interconnections between Kharai camels and the *tamer* plant. By adhering to anthropocentric and economically driven conservation models prioritizing measurable outcomes, such as carbon trading, these efforts fail to acknowledge the nuanced, reciprocal relationships sustaining local ecosystems. To reimagine conservation in a way that is more attuned to these multispecies intricacies, it is essential to place camel-tamer intimacy at the heart of conservation discourse. This shift necessitates moving beyond reductionist approaches that treat nature as a sum of its parts and instead embracing a relational perspective that recognizes conservation as an ongoing, multispecies negotiation. By valuing the lived knowledge of communities and multispecies relationality that coexist with these landscapes and acknowledging the interdependence

between nonhuman beings, conservation efforts can evolve into more inclusive, context-sensitive practices that honor the dynamic and co-constitutive relationships shaping the Indus Delta.

Embracing a relational conservation approach entails shifting the focus from individual entities to the intricate network of interrelations encompassing mangroves, camel herders, farmers, fisherfolk, conservation bodies, and various elements of the environment. By centering the intimate relationship between camels and tamer plants, conservation efforts can transcend the confines of traditional conservation paradigms, thereby creating an ontological space that nurtures and sustains such profound relationality. However, the form and essence of this envisioned conservation approach continue to evolve as an open inquiry, beckoning for exploring possibilities where relationality thrives and guides conservation practices.

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CHAPTER 5

Summary and Conclusions

This dissertation explores the ancient and historical riverine and deltaic processes and forces that shape the physicality of the Indus Delta and how the colonial and postcolonial riverine infrastructure has trapped the water and sediment upstream, transforming the delta's physicality and human and other-than-human relations in the Indus Delta of Pakistan. By physicality of the Indus Delta, I mean a place constituted by a dynamic land-water configuration. In other words, deltas come into existence through the interplay of land and water. The rivers that feed deltas transport sediments eroded from upstream lands and deposit them at their mouths to create deltaic lands and fertile agricultural grounds. The marine processes of sea tides, typhoons, and coastal earthquakes erode and redistribute the deposited sediments to create deltaic landscapes such as estuaries, creeks, lagoons, wetlands, etc. Humans and other-than-human beings realize their potential in these deltascapes. For example, upland deltascapes provide fertile agricultural lands, wetlands provide a conducive environment for mangroves, and migratory fish move upstream via estuaries and creeks.

These fragile ecosystems are experiencing rapid degradation, driven largely by the expansion of upstream riverine infrastructures. The construction of dams, barrages, and irrigation networks has significantly altered the natural flow of water, disrupting sediment deposition, reducing freshwater inflows, and increasing salinity levels through saltwater intrusion. As a result, the ecological balance of these environments is

unraveling, leading to widespread habitat loss, declining biodiversity, and the collapse of critical life-support systems (Kidwai et al. 2019). The consequences of this ecological transformation extend far beyond environmental degradation; they are profoundly reshaping the lives and relationships of local communities and other-than-human beings that have coexisted with these ecosystems for centuries. Fishing communities that once thrived on the seasonal rhythms of the river now struggle with shifting water dynamics. Not only fishing communities but fish, too. The fishers told me that in the past, Pallo would start upward migration as early as March or April because, by that time, the river would start swelling with coming heat and melting of glaciers. The return migration would take place in October. Today, only during the flooding season, in August or September, fishers witness the *Pallo* migration upstream. The changing river and *Pallo* have perturbed the coordinated intertwinement. Similar stories can be heard from camel herders living in the mangroves with their camels. The traditional lifeways of these communities, human and nonhumans intricately woven into the fabric of the delta, are being disrupted, forcing many to migrate or adapt in ways that challenge their cultural identity and livelihoods.

In examining these shifting dynamics and human and other-than-human relations, this research offers several significant theoretical contributions across river and deltas studies and to the theoretical fields of political ecology, multispecies ethnography, and conservation. First, this research adopts a "deep time" approach (Irvine 2020), integrating theories of new materialism, especially geological anthropology (Coole and Frost 2010; Oguz 2020), to investigate the ancient and historical geological processes that have shaped the Indus River and its delta over millennia. Moving beyond human-centered

temporal frameworks, this approach situates the delta within broader planetary and geological epochs, recognizing the agency of inhuman forces such as tectonic activity, sediment transport, sea tides, and climatic shifts. This theoretical lens challenges static conceptions of deltas, instead emphasizing their continuous becoming through material entanglements and dynamic processes.

This research further contributes to the amphibious anthropology framework for studying deltas. Amphibious anthropology focuses on "life in deltas" (Krause 2017, 404), which is imperative to reveal how humans and other-than-human beings live and adapt in the delta. I define the life of the delta as an assemblage of inhuman forces and processes that make and unmake deltas and, in so doing, create the conditions for biotic life. By foregrounding the delta's life, this research seeks to upend the biotic/abiotic dichotomy of life and nonlife (Povinelli 2016). To truly understand the life of a delta, it is essential to shift our focus from static entities to dynamic processes and forces as an intricate web of geological, hydrological, ecological, and socio-political interactions. This framework views deltas not as fixed geographical features but as fluid, ever-evolving landscapes formed by a complex interplay of natural and anthropogenic forces. These landscapes emerge as heterogeneous assemblages, where multiple gradual and abrupt processes converge to produce constant transformations (Syvitski et al., 2013; Giosan et al., 2006).

Human activities have become central to shaping and reshaping deltaic processes, often accelerating environmental transformations beyond the natural forces at play. While tectonic shifts, sediment deposits, sea tides, and climatic events like cyclones and floods have historically contributed to the formation and evolution of deltas, contemporary human interventions have significantly altered these processes, often leading to

irreversible consequences. One of the most profound ways human activities disrupt deltaic systems is by constructing large-scale infrastructures upstream, such as dams, barrages, and irrigation networks (Haines 2013; Gilmartin 2020). These structures regulate water flow for agriculture, hydropower, and urban use but simultaneously disrupt the natural sediment transportation process essential for maintaining deltaic landforms. As a result, reduced sediment supply accelerates coastal erosion, leading to land loss and increased vulnerability to sea-level rise (Wells and Coleman 1985).

At the same time, local communities living in deltaic regions are not passive recipients of these changes; they actively respond and adapt to shifting environmental conditions. Fishing communities, for instance, adjust their fishing practices based on changing water flow and fish migration patterns. At the same time, camel herders modify grazing routes to cope with shrinking pastures due to saltwater intrusion. Some communities, facing increasing land degradation and the loss of arable land, are forced to migrate, seeking new livelihoods in urban areas or shifting to alternative economic activities. Traditional knowledge and adaptive strategies passed down through generations continue to be crucial in navigating these environmental shifts.

While these local adaptations significantly enhance the possibilities for life in the delta, broader socio-political and economic structures often constrain them. Policies governing river management, conservation efforts, and infrastructural development are frequently formulated without considering deltaic communities' lived experiences, ecological knowledge, and relations. Conservation initiatives, such as mangrove reforestation projects, sometimes impose external frameworks that fail to align with local livelihoods, leading to unintended consequences such as restricting herders' grazing land

or altering fishing grounds for local fishers. They also fail to consider the intimate relationalities supporting human and more-than-human life, potentially undermining conservation. Thus, the interactions between human activities and deltaic processes form a complex web of environmental change, governance, and community resilience. While constructing infrastructures, expanding agricultural frontiers, industrialization, and climate mitigation? have intensified environmental degradation, local communities continue negotiating and reshaping their relationship with the delta. Acknowledging the detrimental impacts of human interventions and the agency of deltaic communities is essential for developing sustainable conservation strategies informed by the intertwined histories of human and nonhuman actors within these landscapes.

Finally, other-than-human beings' lives and lifeways transform with the changing delta. An example is the *pallo* fish (Hindi for Indus Shad). Shads are diadromous, spending half their life in the sea and the other half in rivers. Indus shads are further categorized as anadromous – spending most of their adult life in the sea but returning to the river to spawn. Thus, for fish ecologists, *pallo* migrates upstream for spawning, often traveling around 400 to 500 km upstream (Waldman 2003). However, for local fishers, the migration is an annual pilgrimage of *pallo* to the shrine of Saint Khizer in Sukkur, located around 450 km from the Indus Delta. Thus, upstream infrastructures not only trap water and sediment but also disrupt the historical coordination among the river, the *pallo*, and the people who have lived in relation to them for generations. This decline is not merely an environmental loss; it represents the unraveling of an entire system of knowledge, ethics, and being. The ethico-onto-epistemo-logical stories that emerge from living with and knowing through the river and its beings begin to fade. With the

vanishing of *pallo*, communities lose more than a source of livelihood or food; they lose a relational world that carries spiritual, ecological, and ancestral meaning.

Positionality and Reflexivity

Reflexivity and positionality are crucial in my research, as they shape how I engage with the field, interpret data, and represent human and other-than-human actors of the Indus Delta. Given an interdisciplinary approach, integrating ethnography, fluvial geomorphology, environmental flows, hydrology, and archival research, examining my own role in knowledge production is essential. Reflexivity and positionality are not just about acknowledging bias but about being aware of how I actively shape the knowledge produced in this dissertation. This is also about being attentive to power dynamics and accessibility that may have shaped knowledge production.

A research bias can be traced back to 2010 when Sindh celebrated "Sindhu Day" (Indus Day) to mourn the river's altered flow towards Sindh, especially towards the delta. I listened to experts, civil society members, nationalist leaders, and fisherfolk as they protested the dams and barrages and water diversion upstream, calling it "imprisoning Indus" upstream to "dry" downstream Indus." As a Sindhi researcher studying the environmental transformations of the Indus Delta in Sindh, my positionality is deeply intertwined with such numerous encounters even before I conceptualized this research. While sharing the frustrations with the communities I engage with, both fishers and camel herders, as well as the broader Sindhi community, this shared cultural and linguistic background provides an insider perspective, allowing me to build trust and foster deeper engagement with the communities. However, I was quite reflexive of this

positionality, and from the beginning of my research, I did not let it overtake my questions and methods. The interdisciplinary approach allowed me to go beyond my affiliations to explore how different forms of knowledge intersect. For example, fluvial geomorphology allowed me to understand the riverine processes that transport the sediments and create deltaic lands. Archival research revealed the Indus River and Delta before any modern dam was constructed. Environmental flows helped me understand the relationship between river flows, species, and human practices. While employing the environmental flows method, I collected hydrological data from colonial to recent times. These data sets allowed me to contextualize better and reflect on local people's stories, comments, and narratives, allowing me to go beyond my affiliations and positionality.

Moreover, my academic training and institutional affiliation create a power dynamic that significantly differentiates me from my respondents. As a researcher, I have privileged access to academic discourse, policy discussions, and conservation narratives that may not always reflect the lived experiences of the communities I study. This necessitates a commitment to ethical research practices that center community voices rather than impose external frameworks. By acknowledging both the benefits and limitations of my positionality, I strive to ensure that my work does not merely document but actively engages with and represents the complexities of the delta's ecological and social transformations. In different contexts, I was perceived as an outsider, an insider, or something in between. While my academic training provided legitimacy within conservation and scientific circles, it positioned me as an outsider in local fishing communities, where knowledge is passed down through generations of experience. Building trust requires engaging beyond formal interviews, participating in daily

activities, and being present over time. Despite these efforts, I remain aware that my identity as a researcher influences access to certain spaces and narratives.

Scholars have been debating the role of gender in ethnographic fieldwork and writing (Abu-Lughod 1990; Behar 1996; Visweswaran 1994; Clifford and Marcus 1986). These and other scholars argue that gender in ethnographic writing is not a marginal concern, it is central to the ethics, politics, and epistemology of discipline. My gender has played a significant and multifaceted role in shaping my research experience, influencing my access to the field and my interactions within it. In certain situations, my gender facilitated entry into spaces that might have been inaccessible, providing me with unique insights into the lives and perspectives of individuals who might not have spoken as openly with researchers of different genders (Muwwakkil, 2023). However, at other times, it posed challenges, restricting my mobility and limiting my ability to engage with certain groups or participate in specific activities. These gendered dynamics were particularly pronounced in the fishing and camel herding communities of the Indus Delta, where spatial and social organization is deeply informed by gender norms and cultural expectations (Ring, 2006).

For example, almost all villages in Sindh *Otaq* is an important space. It is a central place for male members of the village where they gather at different times and spend time discussing everyday issues or even hang around. Often, male guests or passersby to stay in *Otaq*. I also lived in the *Otaq* and had greater access to village people and people visiting the village from other villages. Sitting ideally in *otaq* and listening to their everyday conversation gave me immense data.

In these communities, villages are often structured with clear distinctions between male and female spaces. Men typically occupy public and communal areas such as fishing docks, market spaces, and camel grazing lands. At the same time, women's activities are largely confined to domestic and private spheres. These spatial demarcations affected where I could go and how I was perceived and interacted with. After spending time in the villages and building rapport (Barnard 2016), I could access the female space more frequently, allowing me to gain deeper access to women's experiences of changing deltas.

Ethnographic writing is a form of knowledge production, shaping how the delta and its inhabitants are represented (Clifford and Marcus 1986). My theoretical frameworks inform how I conceptualize the delta as a dynamic, relational space. However, this raises the challenge of balancing complexity with accessibility. While I seek to move beyond rigid binaries of nature and culture, I must also ensure that my writing does not obscure the material struggles faced by delta communities. Reflexivity and positionality are not merely methodological considerations; they are integral to the knowledge-making process. By critically examining my own role in the research, I sought to produce an account of the Indus Delta that remains attuned to complexity, multiplicity, and the entangled histories of human and other-than-human actors. Rather than seeking a singular or neutral position, I recognize that my research is co-constructed through interactions, methodologies, and theoretical commitments. In doing so, I hope to contribute to a more nuanced understanding of conservation, riverine and deltaic ecologies, and the socio-political transformations shaping the Indus Delta today.

Conclusion

As the world deltas are sinking and at risk are the lives of humans and other-than-human beings (Syvitski et al. 2009), it is important to explore them beyond disciplinary boundaries to understand the emerging problems holistically. This research moves beyond anthropocentric frameworks that position humans as the sole agents of environmental transformation by applying a multidisciplinary layered perspective to the Indus River and its delta. It highlights the agency of rivers, sediments, tides, and other nonhuman actors in shaping the delta's morphology and ecological functions. This approach is particularly crucial in understanding contemporary environmental crises, as it recognizes that human-induced alterations—such as damming, irrigation, and urbanization—interact with and amplify pre-existing natural dynamics, often with unintended consequences. For example, while modern hydrological infrastructures are designed to control and regulate water flow, they also disrupt sediment transport, alter salinity levels, and exacerbate erosion—processes that were once governed by the river's own rhythms and seasonal fluctuations.

Ultimately, this research argues for a more integrative and flexible framework that does not rigidly adhere to a dualistic or a hybrid model but acknowledges the shifting, co-constitutive relations between human and nonhuman forces over time. Rather than collapsing nature and culture into a single category, it advocates for an approach that remains attuned to both the historical specificity of human interventions and the autonomous dynamics of the more-than-human world. Doing so contributes to broader discussions in environmental humanities, political ecology, and multispecies studies, offering a nuanced understanding of riverine and deltaic transformations that neither

overemphasize human agency nor reduce natural systems to passive recipients of human impact.

The integrative and flexible framework will require both methodological and theoretical rigor. Methodologically, this research moves beyond the conventional disciplinary boundaries of natural and social sciences to foster an interdisciplinary approach. Integrating scientific analyses with ethnographic narratives seeks to develop a more holistic understanding of conservation, river ecology, and human-nonhuman relationships.

River ecology, particularly environmental flow methods, has been instrumental in understanding the significance of river flows for both human and nonhuman communities. These methods provide a scientific basis for assessing how alterations in water availability impact ecosystems, fisheries, agriculture, and biodiversity. However, scientific assessments alone can be insufficient to capture the full spectrum of relationships that shape riverine and deltaic landscapes. To bridge this gap, I juxtapose these ecological insights with local stories and ethnographic accounts, recognizing the lived experiences and indigenous knowledge systems that inform people's interactions with rivers.

Ethnographic methods, including participant observation, oral histories, and in-depth interviews, offer valuable perspectives on how local communities perceive and respond to ecological transformations. These narratives reveal how conservation policies, infrastructural developments, and climatic changes are experienced on the ground, often in ways that differ from policy-driven or scientific assessments. For instance, while environmental flow models might indicate a decline in water availability, local fishers

and herders describe this shift in terms of their changing relationships with nonhuman entities, such as dwindling fish, altered migration patterns, the disappearance of particular plant species' crucial to their livelihoods, and more importantly loss of stories that have shaped their relationship with the delta, and nonhuman beings informed by local ethics and morality.

Moreover, this research framework underscores the importance of multispecies ethnography, which moves beyond a solely human-centered perspective to consider the agency and experiences of nonhuman beings. Understanding how nonhuman species, such as camels, fish, and mangroves, navigating environmental changes contributes to a richer, more inclusive conservation discourse. By integrating ecological data with ethnographic insights, I aim to highlight how conservation is not merely about protecting species in isolation but sustaining relationships that define the health and resilience of ecosystems.

It is not about privileging one method over another or using scientific data to verify ethnographic stories. Rather, the aim is to create a space where different methods can run parallel, complementing and informing each other. By allowing these approaches to coexist, this research embraces the complexities of ecological and social realities (Brosius 2006). Rather than treating ethnographic stories as anecdotal evidence that requires validation through scientific data, this approach acknowledges the value of local knowledge as a form of expertise in its own right. The lived experiences of fishers, herders, and farmers offer situated knowledge that often captures ecological subtleties not immediately evident through quantitative assessments. For instance, while environmental models may track declining fish populations, local fishers may describe changes in fish

behavior, spawning cycles, or migration routes based on generational knowledge that extends beyond the scope of conventional scientific observation. Similarly, camel herders may deeply understand how mangrove availability influences camel health, grazing patterns, and even the broader ecosystem, contributing to a more relational understanding of conservation.

This methodological pluralism also challenges rigid hierarchies of knowledge production that have historically marginalized indigenous and local ways of knowing in favor of Western scientific paradigms. By fostering a dialogue between scientific and ethnographic methods, this research resists the tendency to impose a singular, dominant framework for understanding conservation and environmental change. Instead, it promotes an inclusive, reflexive approach where multiple knowledge systems are engaged in conversation, each enriching the other.

Theoretically, this research draws on political ecology, multispecies studies, and decolonial approaches to conservation. Political ecology helps contextualize environmental changes within broader socio-political and economic structures, revealing how governance, resource management, and policy decisions shape ecological futures. Multispecies studies challenge the human-nonhuman divide by emphasizing co-existence, interdependence, and mutual shaping of environments. Decolonial approaches, meanwhile, urge a reevaluation of dominant conservation paradigms, particularly those rooted in Western epistemologies that often marginalize indigenous knowledge and relational ontologies.

By adopting an integrative and flexible approach, this research advances theoretical discussions and provides practical insights for conservation efforts.

Recognizing the interplay between scientific knowledge, local expertise, and multispecies interactions allows for developing more just, inclusive, and ecologically attuned conservation practices. Ultimately, this framework moves beyond rigid disciplinary confines, advocating for a conservation ethic that values complexity, adaptability, and relationality in responding to environmental challenges.

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